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A.H. Bennett
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FARMERS DIGEST

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The Farmer's Digest

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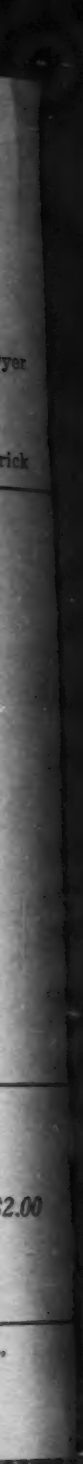

The Farmer's Digest

Volume 4 April, 1941 Number 12

Miracle Maker of the Rangeland

Condensed from American Forests

M. E. Musgrave

YOU would never look twice at the shy, gray-haired little man if you were seeking a maker of miracles—but eighty-one year old John Timothy Page is just that. On his half section of Arizona rangeland twenty miles north of Tucson, this disciple of the land, with only a shovel and a spading fork, has, in the short span of seventeen years, wrought such a miracle in restoring range productivity that the world, represented by a state university and several federal agencies, is beating a path to his door.

As may be expected, John Timothy Page doesn't believe in miracles. "Anybody can do the same thing if he has a piece of land—and doesn't mind hard work," is the way he looks at it. To him, there is nothing unusual in the fact that a man past sixty should set out with a shovel and a spading fork to rehabilitate a piece of stripped, eroded and worn-out land, to make an oasis in a near-desert. Nor is he awed by the fact that what he has accomplished is of such importance to the scientist that the University of Arizona has purchased his "piece of land" and, with the cooperation of several federal agencies, will operate it as a demonstration area in plant succession in the rehabilitation of rangeland. John Timothy Page sees in this only a means of continuing the work his aged hands can no longer carry on.

The story of how John Timothy Page brought 320 acres of Arizona rangeland back to productivity, of how this aged man, with only a shovel and a spading fork, made miles of furrows and ditches over his place, of how with only the native earth, brush and stones he built small dams to hold or to divert flood waters, building them not once or twice but over and over until they held—this is a saga of the range. It would have been so easy to become a Joad! Why try to

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wring a living from worn-out acres? Why not choose the easier way? He might justifiably have asked for and received the "relief" designed for just such cases as his. But he preferred independence at the price of back-breaking work. In his story lies the germ of salvation for thousands of square miles of the nation's rangeland as well as for the peoples who inhabit them. For what John Timothy Page has done they, too, can do, and the sooner they begin, the easier will be the task.

Two other things he had—a wife who was willing to stand with him shoulder to shoulder, and a deep reverence for the land. "A piece of land is a loan from God," he said simply. "It is not to be abused." This is his creed.

"I was working for a street car company back in Kansas," he told me, "but every turn of the wheels made me more discontented. I'd been raised on a farm, and the more I pounded up and down the city streets the more I was determined to have a place of my own. At last it got so bad I couldn't stand it any longer. I decided to homestead in Arizona."

He laughed. "Things had changed when I finally got here. There wasn't any land worth taking to be had that way, so I began looking around for a farm or a small ranch that I could buy. At last I found this 320 acres.

"It wasn't much to look at. It was entirely bare in places, and about the only things that grew here were cactus, snakeweed and rabbit brush—things that stock wouldn't eat. There was a little feather-grass (*Andropogon*), and here and there a few patches of other perennials. Harvester ants and kangaroo rats had just about taken over the place. I guess there were miles of their tunnels underneath. It didn't look much like the place for dry farming I had wanted.

"I decided to get rid of the pests first. Every time we had a rain I took my shovel and dug ditches to run as much water as I could into the rats' and ants' nests. The first few years I couldn't see that I was making much headway, but after a while I noticed that the bare spots around them were covered with thick feather grass. The old rat dens were completely hidden. What had been eye-sores were now the best places on the half-section."

I remembered that the University of Arizona agriculturists had spoken of this when I had declared my intention of coming out to see the place. The pests had achieved an aeration and fertilization of the soil that tended to make it highly productive. They had also carried in seed which the flood waters had

flushed from underground with a result that was amazing.

Mr. Page knew little of what scientists call plant succession, but he did know that nature, if given the time and the opportunity, has a way of replacing noxious or unpalatable plants with vegetation high in forage value. It was this that gave him courage when dry farming failed. For the slight rainfall came too late in the season. His crops had withered in the scorching sun before the life-giving moisture came. But he still hoped that the precipitation on the watershed above might be sufficient to enable him to catch enough in small tanks for watering a few cows. If the range plants could come back, and if he could grow even a few small patches of corn and small grains, it would mean a modest living for himself and his wife. This, too, after tragic trials, ended in failure. For lack of available water the cows had to be sold.

But the Pages were by no means licked. They had a few chickens and a vegetable garden. They had also some figs, apricots and a few grape vines. Keeping these things alive taxed their strength and ingenuity, for they had no well and there was never any money with which to have one dug. They had only a small cistern for domestic purposes.

Every drop of water that fell on the place was hoarded. A black cloud or the rumble of thunder was the signal for feverish activity. When the rain came, Mr. Page shouldered his shovel and worked like one possessed of a demon of energy. He dug small ditches at every place where there might be a concentration of flood waters. He carefully guided it over the entire area to get the best possible distribution, and there it was left to spread out and soak slowly into the earth. That which flowed into the arroyos, or gullies, was watched anxiously, for here earthen dams and dikes had been built in the dry season, and the question was, "Will they hold?"

Usually they didn't. Time and again the structures were washed out, time and again precious water that might have been spread upon the thirsty earth was lost. And between the floods on the one hand and the parching acres on the other stood only an aged man with a shovel. But he knew that human persistence with nature's assistance must finally win. Grass was beginning to grow on the dams and even though a part of the structure might break away, that which remained was being bound together by roots. So he rebuilt doggedly. After several years of this, the dams were completely covered with grass sod. One victory had been won.

But at this point death slipped in and robbed him of his wife,

his helpmate, and for the first time he felt that he couldn't go on. In what he afterward called a moment of weakness, he allowed friends to persuade him to move into town and to accept an old-age pension from the State of Arizona. A young man was engaged to take care of his place and to carry on the work.

"But he didn't feel about it like I did," the old man said earnestly. "He couldn't see much of a future in it for him. As for me, I was worried all the time—afraid the gate was open or the fences down and that stock would get in and undo in a short time what it had taken me years to do. Besides, I felt that I owed something to the state that was paying me a pension. I could pay that debt by building up the land for the future. It would be better for the next generation and would be worth more in taxes to the state. Of course, I could have sold the place, but I wanted to be sure just what would be done with it."

Harassed by such thoughts, and driven by a zeal that amounted almost to fanaticism, he had left the comfort and ease of retirement and had come back to take up the shovel. It was here, despite his eighty-one years, that I had found him at an early morning hour. A quail called from a fence post. His wrinkled face brightened.

"There wasn't a one on the place in the early days," he said. "In fact, there was hardly a bush big enough for one to hide under. But we liked the birds, and one of the first things we did was to plant a mulberry tree to attract them. The mocking-birds came with the very first crop of berries."

For a time he worked industriously. I followed at his heels. "Look!" he pointed. "It was right here that I saw the first Rothrock grama and tabosa, and over there I discovered a scattering of sacaton. Of course that was much better than snakeweed, but I wanted something better. It's funny, isn't it, how Nature fights to protect her own? If you strip the earth of the best, she brings out something else not so good. Then if that is taken, she uses something less attractive until she finally gets plants that even a goat wouldn't eat. It's her last attempt to hold the land. Those University fellows told me that it takes from five hundred to a thousand years to make an inch of good soil. If it's left bare, one big flood takes it off in a few minutes. That's why I'm working so hard to get every foot of this land covered with some sort of vegetation."

He chopped furiously for a few minutes. Through the long years he had taken out the weeds and noxious plants, a few at a time, to facilitate the coming of better ones. He had never been

able to reseed, but by taking out a weed here and another there, and by forking up the hard earth he prepared the soil for grass seeds dropped by the wind. Gradually a little black grama, some hairy grama, and blue grama had appeared on the low ridges. Sacaton had begun to spread over the low places. In the arroyos and on the bare, eroding slopes vine mesquite got a foothold. Its long stolons, spreading flat over the earth, traveled rapidly, taking root as it went. As a soil binder it was a magnificent weapon with which to combat erosion. Then, too, it caught debris and litter in its thick mat, thus speeding up the process of soil building.

Where this process had advanced, the vine mesquite, having done its part in Nature's scheme, was being succeeded by a better forage plant, the curly mesquite. Mr. Page was delighted one day to discover bush muhly pushing its way up through clumps of cactus and rabbit brush. It was even coming up among the young mesquite trees. Oh, it was a good range plant, this muhly, one of the greatest predators in the plant kingdom. It would choke out the thick brush that had fulfilled its destiny by holding the earth against erosion until such time as the better plants could establish themselves. Giant sacaton nearly head-high was taking the place of the smaller varieties, and in the low places where sufficient water accumulated tall Johnson grass waved.

John Timothy Page had never for one moment regretted that he chose the hard way. Recently his dream for the half section was fulfilled. The University of Arizona, as well as other state and federal agencies, became keenly interested in it as a demonstration of plant succession in the rehabilitation of range land. Recognizing it as a definite contribution to science, a philanthropic friend of the University bought the place and presented it to the institution which, in cooperation with these other agencies, will continue the work begun seventeen years ago by an old man with vision and a deep love for the land in his heart.

Herefords in New England

Condensed from Eastern States Cooperator

Clifford L. Clevenger

Supt. of the Livestock Depart., Mount Hope Farm

HEREFORDS in New England! That's now a common subject of conversation whenever livestock men get together in the Northeast. Not a new subject, either, as from the time the first Herefords were brought to this country from England they have grazed our hillsides and proved their worth whenever and wherever given half a chance to do so.

It is quite generally agreed that many sections of the Northeast are better adapted to Herefords and sheep than to dairy cattle and such a program would be beneficial to all concerned. Many such localities produce little grain under the present system of management, and being some distance from commercial centers must pay an excessive price for all concentrates purchased, and these same milk producers have to pay a heavy trucking fee to get their milk to market. In all too many instances the volume of milk sold does not warrant the expensive sterilizing and cooling equipment the various health departments rightly demand. It is to such farmers that Herefords appeal and where a steady growth in their numbers is taking place.

It is quite a change from dairying to beef raising and anyone contemplating such a move must adjust himself and his farming to the new line of endeavor. First, the regular milk check will not come, and plans must be made accordingly; second, the labor required to operate the farm will be greatly reduced; and, third, the big feed bills that are a constant source of worry will not put in their monthly appearance.

Taking these points in their order, some way must be found to carry on while the calves are growing—sheep, poultry, maple products, cash crops, or possibly some of the money left over from the sale of the dairy cows.

Second, the operating expenses will drop at once, as much labor and expensive equipment will not be needed, and during the busy growing season the cattle will be on the other side of the fence chewing their cuds, and there is no better milking machine made than a lusty Hereford calf, and what a relief it is to know the bacteria count never

Reprinted by permission from the Eastern States Cooperator, Springfield, Mass.

enters the picture. Long days with few chores at each end are a tremendous help during haying.

In the third place, feed bills must and will be done away with. The breeding herd must be carried on roughage and grass and any effort put forth to improve the quality of either sources of feed will be well worth while. Bigger calves, which mean more money, will be the result.

Perhaps the writer's personal experience would be of interest at this point. As a young man in charge of one of the large ranches in Montana, it was routine work to saddle a pony and ride miles in the early morning with the temperature "way down below" to a stack of alfalfa hay and throw the hay over the stout barbed wire fence that protected the stack from the hungry cows. This done, the next stop was the nearest water course to see that there were open holes to drink from.

For the past 14 years the herd here in New England has been carried on under as nearly similar conditions as possible. The calves come in April and May, just before or just after turning-out time and before the flush grass distends the udder for too small a calf to appreciate and profit by. The cows and calves run together all summer, no labor except to salt and count them periodically. The bull is turned with the herd at the proper time and a very good calf crop always results. The calves are weaned in November, this year the 25th, and average about 450 pounds. Some of the cows' udders will fill, but if left entirely alone no damage will result.

The cows are carried through the winter in a large shed with a wide door at one end that is never closed. Water is in the yard. No grain is ever fed to the cows; previously their sole ration was hay, but this year we have a silo full of grass silage to supplement the hay.

The calves will get the best hay available, silage and one pound of grain per day—corn, oats and oil meal. Next spring the steer calves will be put in a pasture by themselves and in August will be started on a limited corn ration, while still on grass, preparatory to being marketed in the fall. Under these conditions they weigh 900 to 1000 pounds at 18 months and are good enough to build a good reputation locally. We make no effort to produce market-topping cattle as we feel this phase of cattle production should be left to the Corn Belt where plenty of cheap grain is available. Our aim is to produce good useful cattle at a profit.

The small amount of corn and oats required by the calves can be grown at home and the oil meal can, in many instances, be replaced by homegrown soy-

beans. Only a few bushels of corn are required to feed a steer as outlined above and with the time available on a beef farm there is no reason why it cannot be produced.

To be successful with Herefords one must have lots of grass, more hay and a varied amount of good crop land, the more of the latter the better, but care must be taken at all times to keep expenses down, particularly labor, and a good local market helps keep the ledger black and that is the primary reason for Herefords in New England.

Invents Crop Moisture Gauge

A simple device for the rapid determination of moisture in forage and grain crops was shown at Farmers' Week by its 25-year-old inventor, Robert Q. Parks, an instructor in agronomy at Ohio State University and assistant agronomist at the experiment station.

Helping to solve one of the farmer's most puzzling problems, the new device is described as reasonable in cost, simple to handle, and capable of being operated from any fence post.

By a novel combination of chemical and mechanical principles, the device gives a direct reading of moisture content of any crop. Time required for any one determination is 10 to 20 minutes, but a series of samples may be run simultaneously. The method used is one of adding a chemical, calcium carbide, to a sample of the plant tissue and then measuring the loss of weight produced by the reaction which takes place.

Tests have shown that it works equally well on any plant tissue —grain or forage, and it can be relied on to give a figure within two percent of the actual moisture.

R. D. Lewis, chairman of Ohio State's agronomy department, states that it is the simplest, most readily operated, and the cheapest method he knows for determining moisture in various farm crops and that it will make possible more accurate timing of various operations with farm crops—telling when to combine wheat, when corn is ready to be cut and shocked, when meadow crops can be properly put into silos, and when seed corn is sufficiently well dried to protect against mold and freezing damage. —*Ohio Farmer*

Justifies Mechanization

Condensed from Cappers Farmer

M. N. Beeler

HOW, J. W. Dwyer was asked, could he afford to own a field ensilage cutter without a silo. The machine stood at the end of a strip of corn stubble, adjacent to a feed lot, where 260 1,200-pound steers were rapidly ripening for early December sale.

"I'll get 7 weeks of use out of it this fall," he replied. "And at the end of that time it won't owe me much."

"You mean it'll pay for itself in one season?"

"There's a way to figure it."

"How?"

"Put down 25 or 30 bushels of corn—no, take the least figure. Now multiply by 50, the number of days I'll use the cutter."

"That makes 1,250."

"Now multiply by 61." A big truck rolled into his drive. "There's a load of 61-cent corn, now," he continued.

"It totals $762.50."

"That's $32.50 more than I paid for the machine. Besides I'll save the full time wages of one man for 7 weeks and when I get thru between 35 and 40 acres of corn will be harvested—and fed."

"But how do you arrive at the saving in 61-cent corn?"

"These steers had been on clover pasture, supplemented with old corn and cottonseed meal up to the first week in September. When I shut them in the lot and began feeding green chopped corn, I cut the old corn allowance by 25 to 30 bushels a day and changed to linseed oil meal for the supplement. They're eating half an acre a day of the green cut corn, which means about 35 bushels of new ear corn, and they're getting 35 bushels of old corn. On that ration they're gaining 3 pounds a day, which I think justifies my estimate that stalks, blades and shucks are replacing at least 25 to 30 bushels of old corn a day.

"After we get to the other end of the field it takes only 10 or 15 minutes to cut a row, load an 8-by 16-foot rack, all 2 big Belgians care to pull, and perhaps not more than an hour to chop and distribute the 5,000 pounds. If you want to figure some more, credit the machine also with 2 cents a bushel mechanical husker expense on all the corn we get out of the field this way."

Feeding chopped, green corn is a practice of long standing on that Johnson county, Iowa, farm,

Reprinted by permission from Capper's Farmer, Topeka, Kansas

so the saving in grain effected by the forage is an established fact. Until last fall the corn was bound, hauled to a stationary chopper in the barn, blown into an overhead bin and finally loaded into a wagon and hauled to the bunks. During the season when green corn was being fed the equivalent of one man's time all day was required at this job. The new way is easier and cheaper.

Altho the machine rarely misses an ear, there is some shattering, as corn matures, when ears go into the knives. The grains which escape the elevator and drop to the ground are picked up by lambs which range in stubble seedings and in the cornfield. Later the same lambs will have access to fields harvested by mechanical picker.

He received 300 westerns August 12 and turned them on young clover in barley stubble, old clover meadow, and bluegrass.

"Altho they could go into the corn at will, they didn't do so for 4 weeks," said Mr. Dwyer, "or until about the time we began chopping. You'll note they've picked up all the shelled grain and there's not a weed in sight except velvet leaf, which sheep refuse to eat. A little later these lambs will follow the picker, and for that purpose I prefer them to hogs.

"They averaged 69 pounds into the field and will weigh 90 now. I'll expect them to go at 100 or 105 by the time all the forage is gone. Thus I get 30 pounds of lamb gain off of what would be wasted otherwise."

Behind the steers he runs enough hogs to clean up waste and undigested grain. It is especially important to have hogs when chopped green fodder is being fed to salvage what the steers refuse. "When one vomits on feed in the trough it won't be eaten, and inasmuch as that happens frequently when green corn is fed, we practice cleaning the bunks twice a day," Mr. Dwyer explained, "and throw the leftovers out to the hogs."

Mechanical husking experience on his farm dates back more than 20 years, to the time when all power was supplied by horses. The older machines were none too perfect and they were slow in comparison with the 2-row tractor mounted model he has used the last 3 seasons. "But we had to have them," he said. "Hand husking rates got too high and labor was scarce. It took 9 horses to get the corn out with the first one I had, 5 on the machine and 4 on wagons. Now I do the husking myself and have 2 men to haul. We crib 1,000 to 1,200 bushels a day and don't work hard either.

"My costs don't exceed 2 cents a bushel, compared with 8 and 10 we used to pay hand huskers.

Now there are few good men who want to work and no teams for them to drive if they did. Rates dropped some for a while when use of pickers became general, but owing to relief employment and scarcity of men who want to do farm work, they are up again, higher than the price of corn justifies. Two years ago lots of corn was left out all winter because farmers who depend on hand huskers couldn't pay the price asked. I contend that the cheapest corn picker you can buy will beat the average peg man every way. It will leave less corn in the field and take the silks off better. Besides you'll get the corn cribbed before it is weather-damaged and in time to do something else before the ground freezes."

Just as Mr. Dwyer has mechanized corn harvest, so he also has mechanized its production. He has a big general-purpose tractor which will pull 3 bottoms and a harrow, besides a 12-horse load. "And it will do," he asserted, "as much as any 16 horses you ever saw. Four 4-horse teams would require 4 men, and you couldn't go out and hire that many dependable drivers. Further, it doesn't cost as much to fuel and service the tractor as it would to feed 16 horses. Then after you've worked the tail off it, it can be traded in for half the original value. There's no such salvage in horses that have worked that proportion of their allotted service.

"I use this big general-purpose tractor every day. It plows and works down my land, plants my corn at the rate of 50 to 60 acres a day and then cultivates it, 40 to 60 acres daily, depending on the stage. It pulls the field ensilage cutter, operates the 2-row picker in harvesting corn, binds and threshes my small grain and cuts my hay. I process everything that goes into the feed bunks, so when it is not busy in the field it is operating the feed mill."

Reference to haying reminded him of another operation where mechanization has reduced labor. "I haven't had a hay loader for years and I wouldn't go back to the side-delivery rake method of curing hay on a bet. You see I pasture steers on the clover 6 or 7 weeks until they begin to trample it down. Then I take my tractor and 10-foot power binder and bind it. It takes 5 pounds of twine an acre. Then the bundles are set up, 6 to a shock. It makes no difference how wet the weather is or how green the clover. It cures out without spoilage and without loss of leaves, which is the most valuable part of clover hay.

"Then to get it into the mow, I use my grain separator with blank concaves. That threshes the hay just enough to make it handy to feed, and the blower

eliminates any men to work in a hot mow. With 4 teams we put 85 acres, 240 bundle rack loads, into the barn that way in 5 days. It's a quicker and easier way than the old method. Sometimes there's enough seed in the clover, which we salvage by using the separator, to pay cost of hay making."

By using long pick-up guards on the binder he asserts it will do a cleaner job of cutting than a mower. Timothy is handled in the same way, and he believes the method would lend itself well to saving alfalfa, especially when curing weather is not favorable.

Chickens Dangerous to Hogs

HOGS are more susceptible to chicken tuberculosis than are chickens themselves, according to a recent experiment by investigators of the U. S. Department of Agriculture. Therefore the Bureau of Animal Industry warns that it is hazardous to allow chickens to run in the same lot with hogs. It is not only hazardous—from the standpoint of the chickens—but it is a menace to the health of the hogs if there is any trace of avian tuberculosis (chicken TB) in the poultry flock.

In the experiment at the Beltsville Research Center, 50 chickens and 31 hogs, all negative to the tuberculin test, were placed in a pen with 50 tuberculous chickens. The pen was built with wire mesh for the top as well as the sides and equipped with elevated feed hoppers and roosts for the chickens.

After the hogs and chickens had been exposed to the infection for a year they were tested with tuberculin and 93.5 percent of the hogs and 54 percent of the chickens reacted. When 28 of the hogs were slaughtered, 23 of the carcasses showed slight lesions of tuberculosis and avian tubercle bacilli were recovered from most of them. The other five were classed as "no-visible-lesion reactors."

The practical application of the experiment suggests the following preventive measure, says the bureau. Keep all poultry away from swine. Even if there is no evidence of tuberculosis in the poultry flock there is little to be gained in letting the chickens run with the hogs. There is also the constant danger of chickens being killed and eaten by the hogs.

Extension Work and Democracy

M. L. Wilson

Director of Extension Work, United States Department of Agriculture

COUNTRY people can always find some things about city life that they envy. And city folks talk a good deal about the advantages of living in the country. One of the things they bring up quite often is that people on the farms have a cooperative Extension Service that keeps them up to date on their farming and homemaking business and brings them together in a "We-can-do-something-about-it" spirit.

The truth is that the Extension Service is merely a tool, although an important one, in the agricultural democracy which has been perfected in the United States over a period of many years. It is a manifestation of the kind of educational system which men like Thomas Jefferson felt was as vital for the continuance of American democracy as the Declaration of Independence was in establishing it.

Agricultural extension work furnishes a pattern which could well be followed among urban groups to promote a more general understanding of the problems of consumers, labor, industry, business, and agriculture, and a wider urban participation in the democratic process affecting the general welfare.

The Agricultural Extension Service is primarily an educational service. It is a cooperative system in that the local community, the State land-grant college, and the Department of Agriculture take an active part in it. The county agricultural and home demonstration agents enjoy the distinction of being representatives of the State agricultural college and the Federal Department of Agriculture; at the same time they are looked upon in their county as the local authority on all agricultural and home economics information. Farmers have learned to rely on the county agent's technical ability and practical judgment.

Each year approximately five and a half million farm families use the services offered by cooperative extension work. Each participation adds to the knowledge and experience of the user. Each service is a step toward some farm family's solving its problems in an intelligent way. In 1940 an estimated two-thirds of all the farm families of the Nation were served in some way. In addition nearly a million fa-

milies in small towns took advantage of the services offered.

It is important to keep in mind that of the total of 9,000 extension workers, the great majority are employed in the States and counties. Behind the efforts of this employed personnel, we find a membership of more than 800,000 local farmers in county associations fostering extension work.

The present agricultural extension system is the outgrowth of demonstration teaching first advocated early in the century by Seaman A. Knapp. Dr. Knapp felt that farmers would generally be more receptive to adopting improved methods of farming if they had the opportunity of seeing these demonstrated on farms in the community, rather than relying solely on textbooks and a few demonstrations at the college farm. Dr. Knapp's methods finally culminated in the Smith-Lever Act of 1914. Under the authority of this act, agricultural and home demonstration agents carry on educational programs through local meetings, demonstrations, and personal contacts. This work is supplemented by information material made available through the local press, radio, publications, exhibits, and motion pictures.

What are some of the services farmers may expect from their county agent?

There are, first of all, the many practical kinds of educational help needed on the average farm. These helps include farm and home management; cooperative marketing; use of credit; farm bookkeeping; protection against insect damage; weed eradication; flock and herd improvement; seed and crop improvement; pasture improvement; farm forestry; farm engineering; building construction and repair; and answers to the many other problems that come up in connection with the routine operation of a farm.

In the field of home demonstration, the practical projects of extension work include better living for the farm family. This part of the program includes helps to farm families on food and nutrition; health; improvement of house and grounds; use of income; financial planning; time management; clothing; and child development.

In the broader phases of agricultural education, many new responsibilities have been placed on extension teaching in recent years as a result of numerous administrative programs.

The various parts of the national farm program require administrative agencies. We have, for instance, the Agricultural Adjustment Administration, Soil Conservation Service, Farm Security Administration, Rural Electrification Administration,

and numerous other agencies with definite administrative duties. So far as possible these agencies are locally manned by farmers. This local responsibility is in the interest of democracy. Each of these agencies has, however, primary educational functions which are generally the responsibility of the Extension Service.

The educational work required in connection with these national farm programs deals largely with the economic and social problems of our agricultural democracy.

Extension agents explain and interpret the provisions of this legislation to farm families so that they may use the facilities which apply to their particular problems and also cooperate on a national scale with other farmers so that the purpose of the National programs may be attained. Many thousands of farm people meet with extension agents during the year to discuss the assistance they can get through participation in the various parts of the national farm program.

While their husbands find solutions to economic and social problems through participation in the "action" programs, farmers' wives find a greater opportunity for the cultural and educational advancement of their families in the newer projects of home demonstration work. In 1940, these projects included community activities, appreciation of music and art, achievement days, and farm women's camps. Home demonstration work also plays an important part in contributing to rural culture by bringing art into everyday life through practice in the use of good design and color in clothing, in home arts and crafts, and through greater attractiveness in farm home furnishings and surroundings. Several successful exhibits of rural art have been held, attracting considerable notice because of the good quality of the entries and the interesting subjects. This year much emphasis will be placed on farm family living. And, important in connection with the national defense activities, considerable emphasis will be placed on raising the nutritional standards of our people to a safer level than where it is at present.

An important part of extension work is the training of rural youth in the rudiments of agricultural democracy. The four H's of club work emphasize the qualities that are so necessary for our national well-being—head, heart, hand, and health. Through membership in club work, boys and girls learn the practical side of farming and at the same time benefit from actual participation in planning, discussion, and leadership. Nearly two-thirds of the Nation's rural youth

is served through 4-H Club work. In 1940 the national membership exceeded one and a third million boys and girls. Of the more than 600,000 local leaders who took an active part in extension work, nearly 150,000 were local 4-H Club leaders.

In the course of the past two years, there has been considerable progress in coordinating the educational phases of our agricultural democracy. This has been done through land use planning. Land use planning is the result of an agreement reached by the Association of Land-Grant Colleges and the Department of Agriculture whereby farm people, technicians, and representatives of the agricultural colleges, as well as representatives of the administrative agencies, work together on land use planning committees. These committees study all the factual information made available by the Department and the college, and on the basis of this information agree upon the steps to be taken to deal with the problems confronting farm people in the local community. The county extension agent's office is the center of this activity.

In land use planning, the information made available through the educational facilities of our agricultural democracy is transformed into .recommendations which eventualy become a part of the operating policies of the various farm programs. In this manner the Federal, State, and local agencies, and the individual farm people on the land, have learned to work together in a cooperative, democratic fashion, building up a better rural life. With our modern problems of rapidly changing conditions, with the new and not yet fully realized facilities at the disposal of farmers, the central need becomes that of getting teamwork and of using the functions of government and the resources of the local community and county, the thinking and participation, the judgment and responsibilities of the people on the land as a basis for a unified local program.

I believe that the strength of land use planning lies in the fact that it recognizes that good plans are arrived at by a merging of ideas. When members of a committee get to work studying and analyzing districts in their county, they engage in a process of exchanging ideas. One farmer knows how much a certain area of land has produced over a long time, what crops it has been planted to, and other useful facts about it. Another knows the characteristics of another area. Scientific specialists and administrators of the action programs have information and judgments to contribute. Through the process of integrating these ideas and of deciding on the proper use of each area and each

type of land, the committee members have to weigh opinions, make compromises, and arrive at conclusions. This is the crux of the process of policy formulation in a democracy. As a medium of reconciling conflicting demands, land use planning affords a workable means for cooperation of individuals, interests, and institutions.

Land use planning is a new tool, but its use is developing rapidly. Nearly 70,000 farm men and women are cooperating in the program as members of organized county and community planning committees. More than 1,120 counties have programs under way.

I believe we can and will build an even greater democratic rural civilization in which there is well-being for all through this and similar mediums. We have the scientific research, the educational institutions, the machinery, the technology, the natural resources, and the background of our historical traditions.

Through such an approach as land-use planning, all instruments of government can be used so that local initiative and responsibility can play their full part in giving these instruments direction. Through such procedure I believe we shall accomplish permanent improvement in the matter of farm income, a decided decline in rural poverty, a steady improvement in the situation with reference to tenancy, a sound increase in the number of farm owners, the elimination of destructive soil erosion, and a more stable, permanent kind of agriculture.

The one big hope of democracy is that the people whom it is to serve take an active part in it. To take an active part in modern life, requires intelligent planning, the give and take that comes with discussion, a cooperative attitude toward one's neighbors and fellow men, and a background of common sense. These are the things that strengthen agricultural democracy. They are the things that the Extension Service feels it has the responsibility to encourage among farm people.

Reduce Losses Among Suckling Pigs

Condensed from The Duroc News

C. E. Aubel

Kansas State College

EACH year in the United States, losses from pigs in the suckling stage are about 35 percent.

The average sow raises about five pigs, in spite of the fact that she farrows eight or nine. It is costly for a sow to raise few pigs. At the present prices of feeds, it has been estimated that if only four pigs are weaned in a litter, the cost of each pig is approximately $4.00; but if eight pigs are weaned, then the cost is only two dollars.

What are the causes of these losses? The United States Department of Agriculture named 11 that account for 35 percent of the loss. They claim that 9 percent are laid on, 5 percent farrowed dead, 4 percent farrowed weak, 3.5 per cent have intestinal infection, 3.3 percent are born prematurely, 2 percent are starved, 1.8 percent have scours, 1.6 percent are chilled, 1.5 percent are eaten by the sow, 1 percent have sore mouth, and 2 percent die of miscellaneous causes.

The farrowing of the sows in a herd was recently observed and many large losses occurred during the first week of the suckling period. A 35 percent mortality was frequently exceeded. Some sows lost their entire litters, while others saved only 3 or 4 out of 9, 10 and 11 farrowed.

Those that died seemed to become weaker and weaker each day. Those that survived appeared normal. But the question arises, why did they die? In looking over the 11 causes submitted by the United States Department of Agriculture, many are found that could not possibly have contributed to their death. For instance, they were not laid on, farrowed dead, chilled, nor eaten by the sows because the pigs at birth were taken from the sows, placed in barrels, and returned for nursing at regular intervals for one week. On the other hand, it is certain that only 13 percent of the listed causes could be applied to the deaths in the farrow observed. What then was the cause of this high mortality? Certainly there is much vagueness and uncertainty among hog producers as to why young pigs die.

In late years, many losses in suckling pigs have been attrib-

Reprinted by permission from The Duroc News, Feb., 1941

uted to anemia. The death rate of anemic pigs between 1 and 8 weeks of age has been stated to be almost 20 times as high as the death rate of non-anemic pigs.

This malady was first recognized as a cause of death in pigs in Germany, about 1890. Here it was reported to have appeared after the introduction of the modern hog house and modern production methods, especially in connection with large dairying operations. The cause was attributed then to the fact that the hog was thus exposed to unnatural conditions, and his living made unnatural. In 1923 it was reported in England among suckling pigs when confined indoors. The signs of anemia are loss of appetite, depressed growth, lack of vigor and activity, and quickened breathing. Post mortem examinations show large amounts of fluid in abdomen, enlarged heart, pale internal organs and muscles, increased fluid in the thorax, and low hemoglobin in the blood.

Anemia in suckling pigs is due to the lack of sufficient blood forming elements, as iron and copper. It has been suggested that the lack of blood forming elements is brought about because the pig grows so fast. It is claimed he cannot generate enough hemoglobin without iron and copper to supply the increased size of the body brought on by rapid growth. Milk does not contain iron and copper in sufficient quantities to supply it. Since the young pig depends almost entirely on milk as a source of nutrients for his early growth, he, therefore, starves for blood forming elements. Anemia is thus brought on.

Day-old pigs from sows not properly fed and managed during their gestation period have been reported as anemic. However, the initial stage is from 2 to 5 weeks while pigs rarely come down with it after 6 weeks of age. When death occurs in pigs 6, 7, or 8 weeks old, the cause is generally found in the damage incurred the first few weeks after birth.

An understanding of the disease and the conditions under which it develops most favorably is the surest way to cut down losses. Fortunately, this understanding is possible from studies and observations of experiments. They have brought forth many interesting facts and have disclosed many limitations of the disease, which makes it possible to safeguard almost completely any herd of pigs.

Experiments at the Kansas Experiment Station show that anemia in pigs is brought on rapidly when pigs are kept inside on a concrete floor away from earth. Furthermore, pigs that have developed early symptoms of the disease are rather quickly brought out of the condition by

supplying earth or sod in the pen. They are thus able to pick up enough of the copper or iron from the earth for themselves to assist in developing hemoglobin.

Experiments at Kansas also show that the pigs may be supplied these blood forming elements by painting the udder of the sow two or three times per day with a solution of copper sulphate and iron sulphate mixed with syrup or molasses. In this way, the nursing pigs administer to themselves the iron and copper, and anemia is prevented.

The Wisconsin Experimental Station reports that feeding iron and copper to pregnant sows does not lead to an increased storage of these minerals in the body of the young at birth, which will delay anemia in the suckling stage, thru a greater storage of these elements in the body of the new born pig.

The Indiana Experimental Station reports that sows, which had been running on bluegrass pasture or fed the sod when kept inside a house farrowed pigs which escaped anemia entirely, altho they were kept inside until they were 8 weeks old and fed a ration which had repeatedly produced anemia in pigs when fed to sows which had been kept in dry lot during the gestation period.

These observations are immensely valuable for they show that the conditions which bring on anemia are those which may be easily remedied by proper managing of the sows and pigs. All that is necessary is an understanding of the disease.

The important points in preventing anemia losses in suckling pigs may be stated as follows:

First: If possible, feed the sow on bluegrass or other good pasture during the period of gestation.

Second: As soon as possible after farrowing, put sows and pigs outside on clean earth and pasture. This will protect them completely against anemia if done within a week or 10 days.

Third: If the sows and pigs cannot be taken off concrete floors and put outside on pasture, or dry lot, then painting the sows udder two or three times a day with a solution of iron and copper either in syrup or water will protect them. Bringing pieces of clean sod into the house for the pigs to root in will also help.

Fourth: Encourage the young pigs to eat of their mother's ration. This will have a tendency to help prevent anemia for the pigs can get some copper and iron from the solid food.

Protein Essential in Dairy Ration

Condensed from The Jersey Bulletin

G. A. Williams

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ECONOMICAL production of dairy products is dependent on the producing ability of the herd. Low producing cows cannot be low cost producers. Even high producers may return a small income when poorly fed and managed. Feed exerts a great influence on the cow's production, and protein is the one element in the ration most often out of balance.

The dairy cow needs protein to maintain her body and provide the materials necessary to produce casein and other similar products found in milk. As pregnancy advances, additional demands are made by the developing fetus. The ration should meet these needs. When the supply is insufficient, first the body stores suffer; then milk production declines. Here is where high operating costs and low incomes begin.

Protein is the most expensive part of the ration. Succulent grass four to six inches high is the cheapest source of this necessary ingredient. Next in order of economy are legume hays of good quality and protein-rich feeds, soybeans or cottonseed meal, etc. Although cereal grains such as corn and oats contain protein, the percentage is relatively low and the cost correspondingly high. These grains are valuable because of their carbohydrate analyses rather than protein content.

Some dairymen recognize the importance of protein in the ration but pay little attention to the cost. They consider all grains and by-products in the same class, thus overlooking the fact that the ratio or proportion of protein to carbohydrates must bear a correct relationship in the ration. They seek to obtain the desired level of production from their herd by feeding only home grown feeds. They feed corn alone or corn and oats ground together. Such a system of feeding is possible but far too costly.

A comparative rating of feeds on a protein basis released recently by the U. S. Bureau of Agricultural Economics, illustrates this point clearly. When corn sells at 66.4 cents per bushel, every pound of digestible protein costs 16.76 cents; when bran

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costs $19 per ton, one pound of protein sells for 7.25 cents but the same feed nutrients can be purchased for $3.48 so long as soybean meal is not worth more than $24.20 per ton. The feeder who attempts to meet the protein needs of his herd using corn as the sole concentrate can do so but at a much greater cost than if he adds bran and soybean meal in proper proportions.

These facts are all taken into account when the county agricultural agent or cow-tester advises the dairyman to use a mixture of 400 pounds ground shelled corn (500 pounds of corn and cob meal), 200 pounds wheat bran or ground oats and 100 pounds of soybean meal or ground soybeans, if fed with legume hay and silage. When this mixture is adjusted to the individual needs of each cow as determined by the amount of milk and the percentage of fat it contains, the owner can rest assured that he is feeding as economical and efficient a ration for average conditions as science can suggest.

Such a system of feeding if introduced and followed during the winter would double the dairy dollars on many farms. The needs of the cow are fixed by nature but the ration she consumes is fixed by her owner. Protein is essential in the dairy ration.

Crotalaria

CROTALARIA is creeping farther north every year. Once considered unsuited above the North Carolina Sandhills section, good stands now are grown on the Eastern Shore of Maryland, in Southern Maryland and even into Piedmont, Virginia. Crotalaria especially is suited to light sandy land. On this soil type it will make three times as much growth as soybeans or cowpeas. On sandy loams and heavier soils the growth is one to two times that of soybeans and cowpeas. It is purely a soil-building legume. Livestock will not eat it. Crotalaria will grow as tall as a man, and it is an excellent crop for smothering weeds. It has been known to kill out Bermuda grass in two years. It will not become a weed.

April 1 to May 15 is the best time to plant it, using 15 to 20 pounds of seed per acre broadcast, or 8 to 10 pounds if planted in rows for seed. Seed should be located and the land prepared now. Land on which crotalaria is to be planted should be plowed, disced and harrowed as for any other crop.—*Southern Planter*

Vitamin Farm

Condensed from Texas Farming and Citriculture

J. H. Welch

AS you drive along certain roads in Hidalgo County, Texas, you can see a great spread of fields carpeted with young grasses, not quite like those ordinarily grown in the Rio Grande country. You ask what they are and are told that they are oats and barley together with some rye. But where is the market, you ask, for oats grown on this extensive scale?

The answer is that these crops are not planted here for their grain, but for their grasses, now in strong demand because they are remarkably rich in vitamins, those mysterious food elements that have been given much prominence within recent years. These grasses are harvested in their infancy, so to speak, when they are only about four inches high and have not yet begun to make grain.

Let us observe something of the growing, cultivating and processing of the vitamins. Careful irrigation and the right kind of fertilization are of first importance. From the road you see a long line of pipe stretching across an expanse of vivid green. At one end of the pipeline, near an irrigation canal, a pumping engine chugs away at its task of drawing water from a canal and propelling it along the line of pipe. Over the length of the latter the water spurts forth from many jets, closely placed, and becomes a gentle rain spreading out for some eighty feet on either side of the line and falling lightly and evenly upon the grasses.

In the shower is fluid fertilizer of a kind and quantity determined in the laboratory on this unusual farm to be what is best for the young plants at this stage of their development. From the time of their appearance above ground they are given, with their drink, certain foods calculated to increase their powers as vitamin producers, and from time to time in the laboratory representative specimens are tested to ascertain just how well they are coming up to expectations. To return to the pipeline watering and feeding in the field, when this has been completed for the plants within reach of the water sprays, the line is rapidly uncoupled and relaid with speed across an adjacent sector of the field. Four or five men handle this job and do the work so dexterously that within half an hour after the

Reprinted by permission from Texas Farming and Citriculture, Feb., 1941

grasses in one wide swath have been served, those in another are receiving food and drink.

This kind of treatment is the beginning of the end for the young plants, as is indicated in a nearby field, where the stand is being mowed down by a reaper, drawn into it and shunted through a chute to a truck moving slowly beside the reaper. When a truck has a load it pulls away and is off for an odd-looking structure looming in the distance. Arriving here, the truck stops near one end of a huge revolving cylinder. Conveyor connections are made, and in a moment the grasses are gliding in.

The fate that awaits them is revealed by a look through a sort of peephole. You see a furnace glowing with heat. This is passing into the interior of the cylinder, into which the grasses also are passing and are being rolled round and round with the cylinder's revolutions. In other words, they are being dried; their moisture is being reduced to a very small percentage. At the entrance they have encountered a temperature of about sixteen hundred degrees Fahrenheit and at the exit all but two hundred and fifty degrees have been absorbed in this process of dehydration.

But even this greatly reduced temperature has left the grasses much too hot for final stages of the processing, so they are cooled by degrees in their further journey through the dehydrator. At last they reach machinery which pulverizes them into fine, chocolate-colored powder. In this form they flow into sacks and are ready for the market. The time of their transformation from plants growing in the field to powder in sacks may be less than an hour.

A question as to the uses for the powder opens up quite a vista. As most of us know, the food scientists have discovered that a vast number of human beings who have thought that their eating has fulfilled all the requirements of their bodies, have been wrong. What they have needed most of all has been an assortment of vitamins, and these have been insufficient or out of balance. Virtually all of the essential vitamins are contained in cereal grasses. What greater gusto could you want than that of a bull pawing the earth? And yet a bull derives all its energy from grasses.

So the best of the material that comes from the grass fields and the dehydrator on the Evergreen Farms in Hidalgo County, Texas, is specially prepared and packed for human consumption. The practice is now national in scope, and not long ago an order for the powdered cereal grass came from Suffolk, England.

The bulk of the product, however, is prepared for livestock,

particularly for poultry. In the good old days the chickens were left to forage for themselves around the farm yard, with handfuls of corn thrown to them now and then, but the modern way, as every poultryman knows, is to see that they get a balanced ration, and it has been discovered that when a proper supply of vitamins from the cereal grasses is mingled with the mashes there is added assurance.

The growing of vitamins as such in the Lower Rio Grande Valley is mainly the enterprise of W. A. Harding, formerly of the Delta Orchards Company. During the heyday of land development in the Lower Valley he was active in that field, and as a result of his efforts a great many acres in more northerly parts of the Valley were sold and planted to grapefruit and oranges. Not yet had irrigation been brought to these acres. The trees thrived in seasons of normal rainfall, but they began to languish and fail when the rains became few and far between. It was apparent that most of them would have great difficulty in surviving the period of droughts, so Developer Harding cast about for other means by which these lands might be made profitable.

He had been associated with an excellent farmer, the late W. A. Odum, of Edcouch, and between them they developed a plan for grubbing out the perishing citrus trees and replaced them with alfalfa. They took a trip together to learn all they could about alfalfa markets, and in Kansas City they called at the offices of the American Butter Company, a large corporation with established national outlets for dairy and poultry products.

The call brought momentous consequences. The executives of the company were not much interested in alfalfa, but were greatly interested in oats, barley, and to a less extent, in rye, since these cereal grasses had been found by the chemists to be even richer than alfalfa in vitamins. The visitors from the Lower Rio Grande Valley were asked if oats and the other two crops could be grown successfully in the Valley. They replied emphatically that the Valley soil and climate were highly favorable for these crops and, still more important, that they could be grown most successfully in the winter, when northern fields were frozen.

From various other parts of the United States the butter company was obtaining cereal grasses, but none of these localities were productive in the dead of winter. Only Lower Valley grasses would be ready for the poultrymen and others in the early spring.

The outcome of the call was an agreement between Evergreen Farms of Hidalgo County and the American Butter Company

of Kansas City providing that the former grow, harvest, dehydrate and process the cereal grasses into powder for utilization by the latter in its feed for poultry and also, in more refined form, in food for human beings needing more vitamins in their diet. The method of preparing the finished product for the national markets has important patent protection.

Chemical research brought out the fact that the processed grasses lose about thirty percent of their vitamized feed and food value when in storage for thirty days, about twenty percent more during another month, and so on. To obviate this serious loss, the company's chemists experimentally mixed the powdered grasses with buttermilk, the expectation being that the lactic acid in the latter would hold the dietary values. This proved to be the case. The method was patented and the more or less liquid product for poultry was given the trade name, "greenmilk." However, a difficulty developed. With a steadily increasing demand for this poultry feed, the available supply of buttermilk fell far short of the requirements. The need for a supplemental method resulted in the adoption of a freezing process, also patented, in which the vitamins are kept at a temperature close to zero until the times comes for them to be sent forth on their work for poultry and humanity.

Ross B. Whitman, representing the American Butter Company as plant technician, supervises the planting, feeding, watering and cutting of the grasses, seeing that they get the best of treatment until ready for the harvest. Here Manager Harding steps upon the scene, conducting the grasses through the ordeal of being thoroughly dried out and ground into powder.

An abundance of water from the Rio Grande has been brought to this land through the new Willacy County irrigation system and just beyond the fields looms a gas well with plenty of natural gas for the dehydrator and other fuel requirements. Here is a particularly well equipped industrial plant on a farm. Nowhere can one see a closer union between agriculture and mechanical industry. The payroll provides a living for forty men or nearly two hundred persons, and a new national market has been created for Lower Valley farm products.

Tripping Alfalfa

Condensed from Better Crops With Plant Food

E. R. Jackman

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AT last one of the most baffling mysteries in the field of agriculture seems to be solved—a mystery that has foiled the best efforts of thousands of agricultural detectives, both amateur and professional. Ever since some observant, medieval Saracen promoted alfalfa from a Persian hillside to a Persian field, it has been apparent that the plant did not naturally set seed like most other plants. The Arabs, whose name for the plant signified "best of fodder," put the blame upon the will of Allah; but Americans, less fatalistic, have spent hundreds of thousands of dollars trying to find a way to make the seed set.

So far as tangible results were concerned, investigators, farmers, and scientists alike, might just as well have accepted the old Mohammedan idea. They gradually came to believe though that when heavy seed setting did occur, some outside force was responsible. This agent was variously believed to be wind, humidity, soil moisture, insects, alkali, temperature, and combinations of them.

Alfalfa blossoms have a curious mechanism for setting seed, observed by the early botanist, Linnaeus. Every alfalfa seed grower in the nation has noticed it and racked his brains for a scheme to make it work for him. With most plants, the pollen from the stamens falls upon the stigma (upper part of the pistil), and proceeds to grow and fertilize the female cells, producing seeds. Some plants require cross fertilization, and in these cases, pollen from another plant must be borne by insects or wind to the waiting stigma. All of this is well understood. But alfalfa, seemingly in a stubborn mood to resist seed formation, not only likes cross fertilization, but buries both stamens and stigma where pollen can neither get out nor in, and where neither insect nor wind can find it.

A tube in each alfalfa blossom bears both stamens and pistil, but this tube is enclosed within the "keel," a descriptive name for the lower petals. Before the tube can emerge, the keel must separate along its sharp upper edge. When this happens, the

Reprinted by permission from Better Crops With Plant Food, Dec., 1940, Washington, D. C.

tube snaps upward, shedding the pollen and exposing the stigma for contact with pollen. This breaking open of the keel and the upswing of the tube are called "tripping." Without it, precious little seed is made, and with it, seed still is not set unless there is actual transference of pollen to the stigma. Occasionally numerous flowers trip automatically, a little seed is sometimes set without tripping, and some plants set seed just as well without cross fertilization.

This problem has driven growers to the point of insanity. Untripped alfalfa blooms have tripped all calculations of seed growers. Consider Mr. Pete Simpson in the Milk River Valley of Montana. Pete has tried wheat, but it isn't much of a crop, except on large farms. He is far from market with high freight rates. This in itself shuts out a long list of farm products. By close reasoning he comes to the sensible idea that he should grow alfalfa seed because it is high priced and so can stand freight shipment; it is imperishable, and so beyond injury from market gluts, strikes, etc.; his climate is dry with cool nights, thus producing a superior grade of seed; and by wide spacing he can eliminate much of the drought hazard.

So Pete plants alfalfa and uses every device he has ever heard of to do the job intelligently. He consults his county agent about varieties and determines upon Ladak, because it looks as though the market for that variety will be good for years to come. He gets a good stand for his purpose, uniform, but thin. He keeps out the weeds, applies for certification, and waits for the income. But there isn't any. For some reason no seed sets. The blooms do not trip.

Whereupon he travels around asking questions and he finds advice by the bushel—all of it wrong, it turns out. Some growers advise pasturing; others clipping; some drag their fields with ropes suspended from saddle horns on two horses traveling abreast about 100 feet apart; some say to irrigate once in the fall; others tell him he must not irrigate until the blooms form; one man says to plant barley in his field and the heads of barley waving in the wind will strike the alfalfa blossoms and trip them. All of these things are tried by Pete and discarded. Some years he gets a little seed and some years none, but finally he gets a bumper crop by strange methods of his own devising.

But the next year the same system is followed carefully, and the flowers do not trip. "Maybe that late frost spoiled it," thinks Pete, and he tries again next year. No result, but "perhaps that spell of hot weather in July was bad for it." In the end he gives up, or goes on fatalistically

taking what comes, mostly poor crops with an occasional good one.

Now Pete's story is not an isolated case. It has occurred all over the West on thousands of farms. A common variation of the story is for one farmer to get good yields, whereupon his neighbors try, and thereafter with the larger acreage no one gets much. This suggests bees, but the importation of a few hundred hives does not seem to help. An occasional location seems to give good yields all the time, and the owners of such farms are either smug in their trust in some secret system, or else speak of the fact in whispers, rapping the while on the nearest wood.

American farmers do not take things lying down, and they have demanded seed production studies by their experiment stations. Scientific knowledge has produced this American agriculture of ours; it has bred varieties for all, has controlled most of the pests and diseases, and has helped in myriads of ways in marketing. But it failed on the main part of the alfalfa seed problem. Dr. J. W. Carlson and George Stewart, working in Utah, did the most constructive work of anyone. Here are some of their results, taken from Utah Technical Bulletin 226.

Row plantings gave no particular difference in yield traceable to distances between rows. Planting in hills gave better average yields than in rows or close drilled, but in some years the close drilled plots yielded heaviest of all. No clue here to the tripping, although thin stands in general did better than thick stands. Neither clipping nor pasturing helped any, and no cultivation at all except hand hoeing of weeds gave bigger yields than any kind of work with a spring-tooth or disk at any season. Irrigation at all seasons and with all combinations was tried, and it failed to give as much seed as no irrigation. Manure at from 5 to 15 tons resulted in less seed than no manure. Three years of the most careful experimental work mostly failed to answer the question "What makes alfalfa flowers trip?" Work at other stations has been negative or contradictory.

Some positive results came from the Utah studies. It was shown that only a very small percentage of the blooms ever set seed without tripping, and that with tripping and cross pollination a very high percentage set seed. By counting thousands of blooms it was observed that seed setting most often occurs with flowers in bloom only one day, and that after three days flowers seldom make seed, even if tripped. Beneficial and detrimental insects are listed. Moreover, these positive results were true regardless of season.

These things suggested something to Dr. H. M. Tysdal, of the U. S. Department of Agriculture. He noted the necessity for tripping and reasoned that if flowers one or two days old are most inclined to set seed, then artificial tripping gives little hope because some sort of tripping device, if used every day, would wear out the blooms and the remainder of the plant too. Therefore, farmers must depend upon natural tripping.

Dr. Tysdal says, "From then on the solution was fairly simple, and it is hard to see why we didn't arrive at it long before we did. If flowers must trip to set seed, and do not become tripped without force, then what outside force is there? Wind? We watched fields for days at a time, and very few flowers were tripped by wind action. Insects? That seemed to be the answer.

A little observation showed that honey bees did not help much. They tripped only about three flowers out of every thousand visited. Bumblebees occurred to us next, and we watched and found them very efficient at tripping, but we also found fields full of seed where there were no bumblebees. So we picked out a field setting seed nicely and sat down—sat there all day and watched. All kinds of insects came to call on their flower friends but most of them were of the 'gimme' kind. But it dawned on us all at once that the ground bee was really doing some good. He tripped 80 to 95 per cent of the blossoms he visited! And he seemed in a frenzied hurry to visit a multitude of flowers.

"So we studied the ground bee. He makes tunnels into the ground about six inches deep with a little chamber at one side. In this chamber we invariably found a compact little marble from a quarter of an inch to a half inch in diameter, and on this marble were the larvae of the bee. When we looked at this marble under the microscope it was made up of hundreds of pollen grains, evidently food for the growing larvae. Here then was the answer. Here was an insect after the pollen, as well as the nectar of the bloom, and the only way it could get the pollen was to trip the flower. Other insects wanted only the nectar that they could get without tripping."

The convicted perpetrator of the tripping act is variously called ground bee, solitary bee, and leaf cutter. His scientific official name is *Megachile*. There are several species, and probably other allied genera, but the address of all is the ground. Other species of leaf-cutter bees live in hollow stems and other places, but observation has not continued long enough to know whether or not they too trip alfalfa blooms.

Farmers have long noticed some things about the crop—

that it makes more dependable seed yields under certain conditions:

a. An alkaline soil or a heavy clay.

b. Thin stands.

c. A water table 6 to 10 feet deep, far enough down so that the surface is dry and hard.

d. Continuously sunny weather; a storm or cloudy period stops seed setting completely.

e. A field surrounded by barren land, such as alkali flats.

f. Non-irrigated land, or that needing but one early spring irrigation.

The above qualifications did not make much sense before, but they fall into a pattern now, because all of those things are favorable to the life and work of ground bees. They like a hard, dry soil, because their tunnels remain intact. They dislike irrigation water because it ruins their tunnels and may drown their larvae. They work only in warm sunny weather. Fields bloom more heavily if they have an adequate water supply, but one far enough below the surface to discourage too much vegetative growth. When new growth starts, the blooming of old growth tends to stop. The bees prefer to work in stands thin enough so that they can reach the blooms easily.

I naturally asked Dr. Tysdal, "Why weren't these bees observed before?"

His reply was partly speculative of course. "Maybe it is because they fly with a darting motion and are so swift that they are nearly invisible in the air. One seldom catches them in a net by sweeping the field, because they can avoid being caught. It is also true that some people have observed them. A. E. McClymonds, of Idaho, reported in 1926 that they were good pollenizers. As early as 1914 Department of Agriculture workers Piper, Evans, McKee, and Morse called attention to them. An old seed grower in Arizona said, 'The neighbors call 'em mud daubers, but they look like gold diggers to me.'

"Others have noted them but they were called off from the trail by the occasional plants that would set seed by automatic tripping. And probably, as is the case with bumblebees and weather, no one could think of anything to do about them."

To my query as to what can be done about them, Dr. Tysdal said, "I am not an entomologist, so I don't know. It might help to create around fields areas of bare, hard ground to simulate the alkali they seem to love. But there is one thing anyone can do—if he finds a place where the bees have numerous tunnels, he can fence that spot to prevent molestation by livestock or destruction by farm implements. And if on irrigated land, he can

dike it to keep the water off."

It must not be assumed by anyone that the bees are the whole story. For example, one may have ground bees all over the place but fail to get seed in the bag due to detrimental insects, especially lygus bugs.

Alfalfa blooms more profusely in some places than in others. Extreme vegetative growth tends to reduce bloom. A frost at the wrong time or a drought may ruin fine seed prospects. There are dozens of other factors, but my observations follow those of Dr. Tysdal. One may have the ground bees and no seed, but one seldom has seed and no ground bees.

It remains to be seen what growers and scientists can do to make attractive homes for the bees. Perhaps nothing can be done, but effort can at least be diverted away from so many blind alleys. The finger of suspicion of flower tripping may no longer be pointed at other more unworthy characters, and thousands of western farmers may abandon a whole page full of tricks to make the flowers trip.

Now open for discussion is the question of why the bees prefer certain fields in a community. Perhaps some unknown soil and moisture conditions make flowers in some fields easier to trip than the neighbors's flowers, and the pollen-seeking bees tend to congregate in those fields where their job is easier. It may now become a race between neighbors to furnish room and board for all the ground bees in the neighborhood—if anyone can figure exactly how to do it.

Productive Pastures in the Virginias

Condensed from The Ohio Farmer

Dr. D. R. Dodd

RECENTLY I made a trip to Virginia to attend a pasture conference at the agricultural college at Blacksburg. Co-operating in the pasture research program in that state are the departments of agronomy, animal industry, dairying, rural economics, agricultural engineering, agricultural chemistry, and poultry.

Not only do the Virginians recognize that there is a pasture problem, but they are wholeheartedly attacking it from various angles. Furthermore, their farmers are taking advantage of the results of station investigations and college recommendations.

Pasture Program for Beef Cattle

In southwestern Virginia at Elk Garden, on the home farm of the late Governor Stewart, there is in operation a pasture program not uncommon in that section and which has advantages in which I think many farmers will be interested. Due to the steep and rolling topography of the land and its natural adaptation to pasture, production of corn and other cultivated crops is kept at a minimum. The livestock are wintered almost entirely on pasture with a little hay and other roughage fed chiefly in the field.

The pastures of the farm are of two types. First are the permanent pasture areas of Kentucky bluegrass-white clover, kept in a productive condition by an appropriate program of treatment and management. It is on these areas that the animals graze during the early part of the season and again in the late summer.

The second type is of a semipermanent meadow nature consisting of red and alsike clover, timothy and orchard grass. These larger-type legumes and grasses supply extra grazing in July and August and again in late fall and winter. The heavy growth there on November 8 was sufficient to keep a lot of livestock during this winter and that is why it was there.

Surplus Is Returned to Land

Of course the stock waste a lot of this surplus growth in winter grazing and weather conditions during the winter spoils a

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lot more, but that which is apparently wasted furnishes to the soil a good supply of nutrients with which to grow another crop the next year. This plan may be cheaper than making hay, hauling it to the barn, feeding it there, and hauling the manure back to the field. The idea seems reasonable and apparently is working well.

On my return to Ohio through West Virginia, I passed some beautiful pastures on a farm with the sign "Quincy Dairy Farm." I recalled having had some correspondence with H. R. Young, the superintendent, about pasture problems and I was anxious to see how the pastures were doing.

He showed me 126 acres of Kentucky bluegrass-white clover furnishing all the pasture needed for 120 Guernsey cows in milk. In fact, the cows could not keep up with the growth of the herbage in May and June and that is a serious problem on many farms with improved pasture. The extra growth of grass smothers out the clover and down go both quality and yield. At the Quincy Farm this situation was overcome by mowing 44 acres beginning May 10 and filling a 14 x 35-foot silo with white clover-Kentucky bluegrass silage. The pasture growth was soon ahead of the cows again and additional mowings were necessary before the end of the season.

The reward for these mowings was the maintenance of a beautiful stand of white clover and a high nitrogen supply in the soil and a high protein and mineral content in the herbage. Such a stand of clover is capable of supplying in one season as much nitrogen as would be added by an application of 500 to 800 pounds of a 20 percent nitrogen fertilizer. Certainly the clover is worth keeping.

And the silage has in the past proved so desirable to the cows that whenever they were switched from alfalfa-grass silage to white clover-Kentucky bluegrass silage, they went up one to two pounds per cow per day in milk production, stated R. H. Peterson, the herdsman.

My attention was attracted to two small areas, one of Ladino clover and rye grass, and one of rye. These plants make a very early growth in the spring but it was evident from the size of the areas that they could not carry many cows for more than a few days. "Those," explained Mr. Peterson, "are insurance policies on a good calf crop. With high producing cows we sometimes have breeding trouble in the late winter and spring. A few days out on these areas and the trouble disappears."

The Quincy Dairy Farm near Charleston is operated on a business basis, expenditures are kept within income and its pro-

ductivity has greatly improved during recent years. The herd of 120 Guernseys averaged 410 lbs. butterfat and 9000 lbs. milk for the year on two milkings a day, except for 20 head which had three milkings.

Hints for Better Seedings

Condensed from American Agriculturist

John Barron

Agronomist, New York State College of Agriculture

COUNTY agricultural agents and agronomists in New York have frequently had called to their attention the fact that grass seedings often fail to catch on the heavy soils of northern New York. General observations and a few tests have indicated that possibly a lack of inoculation is a factor so far as the legumes used in the seedings are concerned.

Accordingly, the co-operation of six farmers in northern New York was obtained in the spring of 1940. These men were asked to leave about one-half acre of their oat sowing without any grass seed, but to be sure that they retained enough of the seed of the same mixture they had been using to sow, at a later date, the area which was not seeded previously.

A few days after these men had sown their oats, each one was visited by an extension agronomist and the co-operating county agent. The unseeded half acre in each case was sown by hand to the same mixture at the same rate as the farmer had used on the rest of the field. Inoculation was used on the legume seeds for one-half of this area. After the seed was distributed it was covered lightly with a spike tooth harrow or similar implement.

In two cases the oat crop was so heavy, and lodged so badly that the seedings were severely smothered and no conclusions could be drawn. In the four other cases the seeding on the inoculated part of the test plot was better than on the uninoculated portion. In two instances the improvement was moderate; in one case it was very definite, and in the fourth case almost astonishing. In this last instance there was an excellent stand of legumes and counts showed that there were 25 plants on the inoculated section to one on the

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uninoculated part. Where inoculation was not used the seeding was practically a failure.

The plots in all cases have been definitely marked and observations are to be continued this season. Farmers and county agents who saw these plots felt that, for the next few years, legume inoculation should occupy an important place in farm bureau programs in northern New York State.

There was also an opportunity to make an observation which had not been counted upon. The farmers had sown the greater part of their fields in the usual manner using the grass seeding attachment of a grain drill with the grass seed striking the ground near the grain hoes or ahead of them. The demonstration plots were surface sown, after grain seeding as has previously been mentioned. The uninoculated portion of each test plot was comparable in all respects to the rest of the field except for the method of grass seed distribution.

On the same four farms where inoculation gave a benefit over an uninoculated seeding, the seeding which was uninoculated, but surface sown, was better than the uninoculated seeding which the farmer put out in the usual manner. Apparently the seeds were covered too deep on the heavy soils in which the tests were conducted. There is a great amount of evidence that much grass seed is sown too deeply. Wisconsin agronomists, as a result of tests continued for four years and with seeds sown at four different depths, say that on heavy soils, common grasses and legumes should not be seeded more than one-fourth to one-half inch deep, and on sandy soils the depth of sowing should not exceed one-half inch to one inch.

On the basis of experimental results in Ohio, it is stated that the limits of covering grass seeds should be one-fourth inch to one inch. The experience is that any seeding drilled in loose ground must be closely watched or covering may be too deep.

It appears that where winter grains are grown, seed sown broadcast on them will be covered sufficiently when left to Nature if seeding takes place during the heaving and thawing period of late winter and very early spring. Seed sown later should be drilled in or if sown broadcast should be covered lightly with a suitable harrow or similar implement.

Shallow covering of grass seed sown with spring grain may be generally attained if the grass seed tubes of the grass seeding attachment of the grain drill are extended out behind, not in front of, the grain tubes. If the soil is moist or heavy no further covering is necessary. If it is dry or light, a corrugated roller should be used or there may be a light

harrowing. Good results may often be obtained by sowing the grass seed broadcast by hand after the grain has been sown, or by using a wheel barrow seeder, or other type of hand seeder, and then covering, or not covering, depending on conditions as previously mentioned.

Some people are much in favor of the so-called cultipacker method. This consists of: (1) using a cultipacker or corrugated roller after the grain crop has been sown; (2) sowing the grass seed broadcast by any convenient method; (3) running a harrow or weeder lightly crosswise to the direction in which the roller or cultipacker was first driven. If the soil is not too heavy or too wet, the cultipacker or corrugated roller may be used in the final operation instead of a light harrow.

Kudzu Plants

IN less than a decade kudzu, introduced from Japan some fifty years ago and commonly called a porch vine, has been transformed into an important field crop in the Southeast. Since the beginning of erosion-control projects, more than 40,000 acres of eroded land have been planted to this once ornamental plant.

Kudzu is adapted especially to Southeastern soil and climatic conditions and is not affected seriously by droughts. It will not grow well, however, on poorly drained areas of acid soils or on low marshy lands. The plant is a deciduous, viney legume which grows rapidly during spring and summer months. Kudzu restores fertility to the soil by adding nitrogen and organic matter, and it maintains a stand over long periods without yearly soil preparation and planting. It grows vigorously on eroded land after it is well established, and with a dense ground cover kudzu protects the soil against beating rains. Not only is kudzu especially suited to reclaim badly eroded slopes in cultivated fields, but it also produces a palatable hay and forage of excellent quality, with larger yields than most annual plants grown for hay. Kudzu can be eradicated easily, thus eliminating the danger of its becoming a pest. Kudzu plants set in a well prepared settled seed bed before late April and spaced 12 to 18 feet apart have given excellent stands on thin land. A handful of fertilizer per plant will insure a quick growth.

—*Southern Planter*

"Grandad's Buildings, My Machinery, My Son's Methods"

Condensed from Farm Journal and Farmer's Wife

IN Washington not long ago there was a meeting of a huge committee to discuss farm buildings and find out why, in view of so much interest and so great a need, so little is being done to put farm buildings in shape and to put up new ones.

As is so often the case at get-togethers of this kind, the best things said do not get on the record. Such were the remarks of an Illinois farmer who talked informally with some of the members of the committee in a hotel lobby. He said:

"It doesn't take a survey to show that farm buildings are in bad shape. Not only are they in need of repair, but they are outmoded. I am farming with my grandad's buildings, my own machinery and my son's methods. There will be a lot more new farm buildings put up when the farm buildings specialists provide plans for *buildings that our livestock and poultry can pay for out of earnings.*"

New Demands on Farm Buildings

He was not merely saying that he was using a barn his grandfather built, in the days when horses were used to do all his work in the field and to run a horsepower for threshing, sawing wood, etc. He was saying that the efficiency of the income-producing buildings on farms is way behind that of modern farm machinery, and that today's methods and crops are already being challenged by new things in farm research.

Fifty years (even 30 years) of progress in farm methods, farm crops and machinery have changed the demands made on farm buildings. The general barn has come to be a great deal more than just storage for hay and machinery and a winter overcoat for livestock. It has become a clearing house for chores. Specialization in agriculture has taken away some of the functions of grandfather's general-purpose barn and created a year-round need on other buildings, each used for a separate farm operation.

The milking machine has made milking an indoor job the year round. Use of grain for dairy cows on pasture has made barn feeding a year-round operation. Putting hay crops in the silo has done away with the need for spacious haymows and heavy-

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timbered barns. Feed carriers have made it possible to have the hay (and the fire risk) apart from the barn where animals are stabled and fed.

More Efficient Herds, Flocks

In poultry, the building situation was changed when hen hatching gave way to the incubator, and further changes have come along with mechanical brooding, use of artificial lights, keeping layers indoors the year round and other developments that have made poultry raising a business capable of standing on its own feet. The brood sow, instead of producing one litter a year late in spring or early in summer, is asked to produce two, or even three, litters a year in farrowing houses built for the purpose.

What complicates the building situation still more is the higher efficiency of animals housed. The 300-egg hen, the ton-litter sow and the cow that produces 10,000 pounds of milk or 300 pounds of fat a year, all ask for buildings that give protection against too much heat, too little heat, storms, flies and other hazards of high annual production.

Buildings Animals Can Afford

Because farm buildings have lagged behind farm methods, a great many materials are new to the farmer who wants to remodel, repair or rebuild his farm structures. Some of the farmers who are putting up new buildings are saying, to judge by the structures they are putting up, that the general mass of existing plans is not quite up to the demands made on farm buildings and the new materials available. Some of the farmers, unable to rebuild, repair or remodel, are challenging existing plans from another direction, by putting up serviceable buildings out of low-cost materials, and also materials close at hand—baled straw silos, straw-walled poultry and hog houses, fence-and-paper silos, etc.

Regardless of size, shape, purpose or type of construction, the kinds of buildings most farmers want are those that can be paid for out of farm earnings. This was clearly shown in a government survey of buildings on more than half a million farms a few years ago. Farmers were asked if they would be interested in borrowed money to make home improvements, the loans to be paid back over a period of years. The answers were overwhelmingly, "No."

Instead of letting the improvements of farm buildings wait for better farm income, wouldn't it be wise to cut the farm buildings' job down to where farm income can do something with it? In that question is the challenge that faces farm managers, farm structures specialists and manufacturers of building materials. Can they produce suitable buildings on which a farmer

can lend money to hogs, poultry, and dairy cows and expect to get it back?

Solving the Problem

Here are some things that can serve as guideposts in trying to solve the problem:

1. Survey existing plans for farm buildings, to be sure that plans being distributed to farmers fully meet the changed demands of agriculture for buildings.

2. Make wider use of local building materials and of plans that permit the use of farm labor in construction.

3. Provide greater flexibility in buildings, so that one building, with slight modifications, could be used for several purposes without conflict during the year.

4. Approach the matter of designing and planning income-producing buildings in a new way, so as to get a structure the animal (or the implement) can afford to pay for.

5. Pay more attention to buildings of a type the tenant farmer can pay for out of income, and even take with him to another farm if he moves.

6. Study designs and plans to see whether they permit the use of materials that are readily available, that can be used with minimum of skilled labor, such as sheets of plywood, galvanized sheets, native lumber, etc.

Appraising and Assessing

The bankers, the appraisers, and the folks who invest their money in farm mortgages, can do something to help. They can quit putting all the emphasis on land, and give farm buildings a better break. Generally farm buildings are appraised too low. Not many appraisers of farm land would be willing to sell the buildings for the value placed on them.

The taxing authorities can do something, too. They can quit jacking up the assessments every time a farmer makes some needed repairs or improvements.

The biggest single investment farmers have (on top of land) is in buildings. The total value of all farm buildings in 1939 (the latest figures Uncle Sam will vouch for), in round numbers, was $13,000,000,000, which was about one-forth of the value of all farm property, more than one-third as much as the value of farm land alone, four times the value of tools and implements, and more than twice the value of farm livestock. That figure averages out $2,059 per farm for buildings, or $13.12 per acre.

How much would it cost to put all farm buildings in shape? Well, during that Washington meeting there was reference to a survey made six years ago, in which it was found that nearly three-quarters of a million farms needed new homes, and that over

2,000,000 farms needed other new buildings. Essentially, the need is the same now as then.

It was talked around at the meeting that to put existing farm homes in good repair, it would cost $8,500,000,000. It is safe to say that the cost of putting other farm buildings in repair would be no less than the cost for homes. Think of it—$17,000,000,000 needed for rehabilitation of farm homes and the income-producing farm buildings! That's twice the total farm income for the United States in 1939.

Buildings Need Repairs

Unlike his city cousin, a farmer does not have to get a building permit when he wants to build a new house or barn, or refinish an attic room, or turn an old barn into a poultry house. Hence, dependable figures on farm building activities are scarce and hard to get. There is no single source showing how much new farm building, remodeling or repair is going on. Few people will dispute the statement, however, that depreciation of farm buildings has exceeded upkeep and repair since the bottom dropped out of farm prices after the first World War.

A Hardy Winter Pasture Plant

Condensed from Guernsey Breeders' Journal

E. J. Parminter

Lockwood, Missouri

FOR fifteen years we have been working on a pasture program which would furnish green pasture nearly every month in the year for our herd of registered Guernseys and flock of registered Shropshire sheep.

Our temperature often drops as low as fifteen or twenty degrees below zero in southwest Missouri and the cold is often accompanied by high winds which prove disastrous to green growing plants.

For the past three years we have used Balbo rye for fall, winter and early spring pasture. Since the price of grain has been quite high we have moved the stock around April 15 each year, or as soon as our second year sweet clover was ready to pasture, and allowed the rye to mature grain. Our average yield of grain has been around twenty-five bushels per acre after heavy fall, winter and early spring pasturing.

This new variety of "sweet rye" is the most hardy winter plant we have found and remains a perfect green color even in the coldest weather. We have favorable reports on Balbo rye having withstood the winter as far north as Omaha, Nebraska, and even the southern border of Minnesota.

It is almost unbelievable that this new variety of "sweet rye" *does not taint milk*. Guernseys are especially fond of the pasture, and it maintains that rich golden color in milk even in midwinter if cows are allowed to graze it.

In our thirteen years of experience with Guernseys we have striven for economical yet efficient production and good pasture is playing an important role in this. Since we have been using Balbo rye, sweet clover and Korean lespedeza we have pasture every month in the year. Of course through the winter months there are many days when the cows cannot be out on the fields and the pasture is supplemented with alfalfa and Korean lespedeza hay. But our cattle are allowed to graze the rye every day in the winter, when the weather and condition of the fields will permit, as we feel this develops a hardiness and vigor

Reprinted by permission from the Guernsey Breeders' Journal, Feb. 15, 1941, Peterborough, N. H.

necessary to long life and efficiency.

Since most of our soils in this section of the middle west have been depleted by continuous cropping and erosion we have applied from three to four tons per acre of agricultural limestone on most of our hay and crop land. We also apply each year from 150 to 200 pounds of superphosphate per acre. Our nitrogen for the soil is supplied by the growing clovers and manure from the livestock.

It is interesting to notice the cows pass over a check strip in the fields where no lime or phosphate has been applied and graze on either side; also we have noticed that when our cattle are allowed access to hay, some of which was grown on soil where lime and phosphate had been used, and the other identically the same hay except no calcium or phosphorus used in the soil, they invariably consume the hay first that was produced on the treated soil.

We usually sow our Balbo rye in September if sufficient moisture is present. It may be sown in October or early November with good results, but makes a shorter pasture season.

It grows best on a firm, well-prepared, well-packed seed bed, and should be sown at the rate of about one and three-fourths bushels per acre. It is usually ready to pasture in about three weeks after seeding and can be pastured to about April 15 without injury to a grain crop. Balbo rye can be completely pastured out if no grain crop is desired. In this case it will furnish pasture until about July 15. In the fall and early spring and summer when the rye grows most rapidly it will carry two to three mature Guernseys per acre. This, of course, will vary according to the fertility of the soil, the season, and the temperature. For ample winter pasture we like to have about one acre per cow.

Seeding from Tractor

Quite often we learn of labor-saving ideas of the other person and profit by them. Last spring when grass seeding time came my brothers decided that the old method of walking back and forth across the field with the grass seeder thrown across the shoulder not only was tiresome but required a great deal of time. So they built a small platform behind the driver's seat on a rubber tired tractor. Seated on this platform, using a cyclone seeder my brother sowed an average of eight acres an hour.—Maretta Terrill, Hardin Co., O.

—Ohio Farmer

Coat Colors in Horses

Condensed from The Cattleman

Fred Gremmel

THE matter of recognition and identification of coat colors in horses, and some knowledge of how colors are transmitted is considered by some as being common knowledge of all who are familiar with horses. No doubt, there are many people who have a well-founded knowledge of horse colors but it seems doubtful if there is anyone who could not benefit by a candid review of the subject.

A recent investigation involving chemical, histological, and genetic studies made after and in the light of a number of years of observation, and a thorough review of pertinent literature has resulted in an enlightening of the subject of coat colors in horses.

All the colors in the coats of horses are produced by the same pigment which in an unconcentrated form is of an amber color and is known as melanin. This pigment is deposited in the form of minute granules in the cortex of the hair. The quantity of pigment granules, the extent to which they cluster together, and the distribution of these clusters within the hair shaft determine the color of the hair. Only slight clustering with an even distribution of the clusters results, according to quantity of pigment, in the yellowish and reddish colors. Increase in size of clusters of pigment granules brings about the darker colors. Aberrations in cluster distribution have varying effects as described later.

The amount of pigment shown in the cross section of a given hair seems to be the same regardless of where along the length of the shaft the section slice is made. This causes more concentration of pigment in the tip of the hair where the diameter is smaller than in the main portion of the hair shaft resulting in the tip being darker. While a microscope proves this, it may be seen by the unaided eye by examining the hair of a very light colored horse such as Palomino or by observing the change to a lighter shade of a dark colored horse when he is clipped.

A point worth mentioning before taking up the individual colors is that in the identification of a coat color due allowance must be made for the effect of sunlight and sweat, both of which will fade a color, particularly black, sometimes beyond ready recognition.

Body coat colors of horses may

Reprinted by permission from The Cattleman

be divided into two classes: solid colors and patterns. What are termed solid colors (not considering marks on head, feet, and legs) may be divided into four groups. At one end of the coat color scale is a group of light-colored horses which for want of a better name may be called *ysabellas*. This group consists of three basic colors. The very lightest of these, popularly called "albino" but not truly so, ranges from a pure white with blue or "glass" eyes to a cream color too light to be considered Palomino. Genetically speaking this is the homozygous recessive condition for all major factors causing color in horses. When one dominant factor or "dose" appears there is enough color to produce a Palomino. This now popular golden body color with silver mane and tail is a heterozygous condition and (Hark, you Palomino enthusiasts!) means that this color will not breed true. The third member of the *ysabella* group is produced by the homozygous condition or "double dose" in this case and is a reddish sorrel-like horse with flax mane and tail. Palomino breeders will find that over a long period of time or in a large number of cases the results of mating Palomino to Palomino will be approximately 25 per cent "albinos," 50 per cent Palominos, and 25 per cent flax-maned reds.

The next group consists of the chestnuts. These are recognized by their having neither flax nor black manes and tails; the mane and tail are always approximately the color of the body. In some washy colored chestnuts a "strawberry" effect may be found in the mane and tail. There are two distinct varieties of chestnuts, each consisting of any number of shades. The darker shades of one variety and the lighter shades of the other may sometimes be confused, but in general the lighter one, popularly known as "sorrel," is the yellowish and reddish golden colored horse while the other, known as "liver" chestnut, has a definitely dull hue and sometimes even is dark brown or almost black but having an auburn hue. The red chestnuts or sorrels mated with each other breed true, but the liver chestnuts may throw either liver or sorrel chestnut. None of the chestnuts mated together will throw colors of any other group except their own and *ysabella*. Genetically the relationship of the *ysabella* group and the chestnuts is that a factor (or dose) of the *ysabella* group in combination with chestnut is the reason for the liver chestnut being darker than the sorrel.

The bays, recognized by their always having black manes and tails, comprise the third group. Although the shades blend into each other and exact identification is sometimes difficult, there

are three varieties of bays. The lighter one, a tan color, is known as "sandy" bay. This color is produced by the bay factor alone without the presence of either chestnut or *ysabella* factors. When the chestnut factor is present with the bay factor we have red or "blood" bay. When the *ysabella* factor is in combination with the bay factor we have mahogany bay, commonly termed "brown." From this phenomenon it may be deducted (and such is the case) that sandy bay mated *inter se* breed true; blood bays may throw either sandy bays or blood bays; and mahogany bays may throw either sandy bays or their own color. (It is understood that when a color does not breed true when mated *inter se* a heterozygous condition exists.) Blood bays mated together may also produce red or sorrel chestnut but not Palomino or red *ysabella;* and mahogany bay may produce either variety of *ysabella* but no chestnut.

The last group of basic colors, consisting of but one color, black, is produced by the presence in combination of factors from all of the other three groups. At least one factor from each group being necessary to produce black indicates that most blacks would be more or less heterozygous, thus being inconsistent in their genetic behavior and causing many geneticists to believe this color to be recessive to bay. Yet, heterozygous blacks may and do produce bay or any other basic color although the odds may cause some colors to be the exception rather than the rule.

The members of the class of colors that may be designated as "patterns" are all physical modifications of the basic colors and include paints, roans, duns, grays, and mealy points, and minor odd colors such as Appaloosa and various forms of tiger spotting and streaking or striping. The minor ones will not be discussed here.

The patterns are caused by factors which act entirely independent of each other. That is to say they may be inherited singly, in any combination, or all together, and yet each one may be recognized and identified. Each shows its effect by expressing itself on the basic color; and any basic color may be affected except, of course, Albino.

The paints or pieds which are irregular patterns of white and colored areas include piebalds which are white and black and skewbalds which are white and any basic color except black. The proportion of colored and white areas may vary considerably.

The roans are patterns which show a more or less uniform mixture of white and colored hairs over the entire body. The effect may be on any basic color. In combination with sorrel it pro-

duces strawberry roan, with bay it produces bay or ordinary red roan, with liver chestnut, mahogany bay, and with black it produces blue and black roans. The proportion of colored and white hairs may vary from an apparently solid color, difficult to recognize as roan, to extreme cases in which white hairs predominate to the extent that color is completely lacking, in some areas producing the color known as "calico."

Duns are peculiar in that this pattern affects each individual hair and also the color scheme as a whole. Pigment in the hairs of dun horses is distributed in such a way as to be concentrated in one side of the hair shaft with a corresponding deficiency in pigment in the other side. This gives a diluted appearance to the dun coat. In conjunction with this phenomenon the dun pattern carries a more or less distinct dorsal stripe over the entire length of the horse's top line. Often a transverse shoulder stripe and sometimes zebra stripes on the legs accompany this pattern. In combination with sorrel the dun pattern produces the yellowish "claybank"; with sandy and blood bays it produces "buckskins"; and with liver chestnut, mahogany bay, and some blacks it produces various shades of "smoky" and "mouse" duns, some of which are called "grullos."

Gray is a time-variable factor in that a foal may be born apparently solid color but with each new coat some of the colored hairs are replaced by white hairs changing the horse to a lighter gray each year until he is almost pure white. The factor may vary in its rate of effect. Some grays are almost white by the time they are mature while others may carry some color indefinitely. Any basic color may be affected.

Patterns Any Combination

The mealy points pattern which causes light colored muzzle, arm pits, and flanks has caused considerable dispute as to the proper classification of horses commonly known as brown. Some browns are truly mahogany bays. Some known as "seal" brown are actually black with the mealy points pattern. In this pattern the expression is most distinct in the dark colors as is particularly noticeable in black donkeys and mules and seal brown horses but also finds expression, though less distinctly, in other basic colors. The light color of the hair is due to a specific distribution of the pigment granule clusters by which is produced a pigment-free portion around the outer edge of the cortex of the hair.

As mentioned, the patterns may be in any combination. Roan-paints are not out of the ordinary as is also true of dun-

paints, dun-roans, gray-paints, and gray-duns. Gray roans, though not any scarcer, are more difficult to recognize. Ordinary roans are foaled roan while ordinary grays are foaled solid color. If the two are in combination, the foal is roan but in time turns gray. More than two patterns in combination are somewhat scarce but do exist as a number have been observed. A roan-dun-paint should be a prized animal for the color fancier, while the gray "obliterator" factor must be likened to an evil spirit.

There is one outstanding thing concerning the inheritance of the pattern factors. That is the particular pattern in question must be present in at least one of the parents for it to be transmitted to the foal. Factors that may affect the degree of expression of the patterns may be carried unseen, but the qualitative factors themselves do not hide.

Most breed associations are agreed on the identification of the various white markings. It may be said that these markings are inherited "by the dose." No dose means no marking. When a dose is inherited the amount or extent of white marking is determined by the size of the dose. A small dose may only express itself as a small "star" on the forehead. As the dose increases the star increases in size until it extends below a line of the eyes and becomes a "star-strip." For a further addition a jump is made to the nose where a "snip" appears as company for the star or star-strip. The snip may increase in size and even include part of the lower lip where it is called a "chin-spot," but usually goes upward to join the strip causing the whole to become a "blaze"—at first narrow, then wider, and finally includes one or both eyes making the horse a "bald-faced" and often "glass-" or "wall-eyed." On the feet the markings usually begin on the hind feet by showing a few white hairs around part of the coronet and increase in amount to white feet, then to the fetlocks to be "socks," and extending above the fetlocks to become "stockings." There seems to be no set time for the forefeet to begin their follow-suit play. Of course white markings on a given horse do not change. The sequence is given to show the effects produced by varying sizes of "doses" (genetically speaking, called quantitative factors) and the foal in its inception receives as a result of chance playing the cards held by the sire and dam.

The whole story of color inheritance is based on some of the laws of physics as well as genetics. You cannot get something out of nothing. The foal's color is limited to the resources of the parents. In each parent the existing factors for color are shuffled and a random half of the avail-

able assortment is passed to the foal. So, the foal may be like the parents or, as often happens, he may get a new combination of factors making him appear different from either parent. But the causative factors must be there and they come from the parents. Thus, if we can identify the genetic make-up of the parents we will not be surprised by the color of the offspring—or fooled in some cases by the horse-trader's "This roan is wonderfully bred. He is by Dun Demon and out of Bay Lady."

Date Growing

Condensed from American Fruit Grower

Andrew R. Boone

THIRTY-SIX years ago California's Coachella Valley was a torrid waste. Last year, 2000 of the valley's fertile acres produced 11,000,000 pounds of dates, biggest crop in the nation's date-growing history. Many of the orchards lie below sea level and virtually no rain falls on their sands. Yet agriculture and science combined have caused these orchards to become the world's biggest producers, and the quality of their fruit knows no foreign rivals.

First dates were planted at Mecca, Calif., in 1904, after Dr. Walter T. Swingle, U.S.D.A. explorer, had shipped several-score offshoots of African palms to this country. Those offshoots took root and thrived, and their numbers increased until today more than 150,000 palms have come into bearing or soon will. They represent the real secret of culturing these desert sweets, for only by replanting the offshoot of a vigorous parent can dates be kept true to type. Each seedling represents a new variety.

Unlike most products of the soil, dates require high temperatures and long, dry summers. Less than three inches of rain falls each year in the Coachella, yet the farmers pump from seven to ten acre feet—120 inches—around their roots. To protect the fruit against cracking, permanent paper umbrellas are tied over each bunch. Commencing in September, the crop is picked and moved to a packing house at Indio, where the large, luscious Deglet Noors are packed in tins, while other varieties are put up in transparent bags. Smaller dates are crushed and made into candy, flakes and other confections.

Date palms are strange plants. They grow only at night, and sleep during the day. During the winter, they hibernate; yet when the thermometer climbs once more to 46 degrees F., they resume their cycle of producing. Most of the crop is harvested by mid-December, after which the growers start plans for producing a rich harvest next year. Deglet Noors, representing nine-tenths of the crop, require particular kinds of soil, of which only 10,000 acres are known to be available. Those 10,000 seem to mark the limit of Deglet Noor culture in the United States.

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The Cod Liver Oil Situation

Condensed from New England Homestead

Raymond T. Parkhurst

THE war has definitely affected the economics of poultry and animal production by very materially disturbing the source of a very important feed ingredient—cod liver oil. Normally, we import at least 70% of our cod liver oil from Norway, England, and Germany. Over 7,000,000 gallons yearly came from Norway and England. From New England and Canada we obtained only about 1% of our requirements. As long as the fishing trawlers of the European countries are needed for sweeping mines, very little cod liver oil will be produced. It is reported that England is importing some cod liver oil from Newfoundland to supply her needs. With Germany blockaded, therefore, we can not depend upon European sources for cod liver oil. In the last few months, some cod liver oil has been allowed by the Canadian officials to leave Canada for the United States. Most of these shipments and those from Iceland and Newfoundland will undoubtedly be absorbed by the drug trade at prices over twice the 1939 prices and beyond what poultrymen can afford to pay. The feeding cod liver oil that is coming in, or is on hand in storage tanks, is mostly finding its way to fortified cod liver oil or blends which sell as fortified feeding oils.

Vitamin D Sources

Cod liver oil has been a most important and popular source of vitamins A and D in poultry rations for many years. In recent years, however, several other more potent sources of vitamin D than cod liver oil concentrate have been used for fortifying cod liver oil and for various fish oil blends. Oils from tuna fish, sword fish and skipjack especially have proven to be cheaper sources of vitamin D than the concentrate of cod liver oil. About two-thirds of our supply of these high potency oils come from Japan and about one-third is produced in California. Quite recently sterols which have been obtained from animal tissues have been shown to be of good value for fortifying purposes. These should not be confused with irradiated dry yeast and similar products in which ergosterol is activated as these are not recommended for poultry feeding. Their use in the animal field, when economically feasible, may release fish oil

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products for use in poultry rations. In order to increase the vitamin A potency of certain fish oil blends, shark liver oil has come into extensive use. Booms in the shark catching industry are reported from Florida, California and British Columbia. This oil assays from 50,000 to 200,000 units per gram.

Several oils of domestic origin from fish such as sardines, menhaden herring, rose fish and salmon are now being used extensively as carrier oils for the high potency liver oils and the D-activated animal sterols mentioned above. The amount of these domestic fish oils produced is at least three times as great as the cod liver oil previously imported.

Limited Supply

In general, feed manufacturers and poultrymen have at the present time available to them a limited supply of straight cod liver oil, a good supply of sardine oil and an ample supply of fish oil blends or feeding oils. There are also various fortified products such as fortified cod liver oil, fortified sardine oil and fortified feeding oils. According to the tentative definition of the Association of American Feed Officials, a vitamin D feeding oil is either fish or fish liver oil or a blend of two or more of the following: vitamin D concentrate, synthetic vitamin D, fish liver oil or edible vegetable oil. The vitamin potency shall be stated in A. O. A. C. chick units of vitamin D. Undoubtedly, there will be large volumes of the feeding oils used. If feedmen and poultrymen will pay enough for "feeding oils" from reliable manufacturers to justify the proper processing and testing of them, excellent results can be obtained. On the other hand, it must be realized that some of the oils used now for blending purposes do not assay the same with chicks as they do with rats and unless the chick test is employed faithfully and accurately the guaranteed potency is unreliable and the product may be a source of trouble. Unfortunately, it is the poultryman who suffers first because his chicks, layers, or breeders do not do well. Therefore, a quality product is the safest and its worth dependent upon the reliability of its guarantee.

Artificial Irradiation

The manufacturers of sun lamps and electric power companies have recently started to arouse interest among poultrymen in artificial irradiation of poultry. The new S-4 lamp which is now on market is claimed to be as effective as was the S-1 type 500 watt quartz mercury vapor lamp and is much less expensive. The lamp itself costs about $8.50 and a suspension unit, about $11 more. The lamp is rated at 1000 hours of normal life and the transformer and lamp together consume about 120

watts. One unit would normally be used for 100 birds, 200 four to twelve weeks old chicks or forty turkeys.

Studies made by D. C. Kennard and V. D. Chamberlain, at the Ohio Agricultural Experiment Station, using the S-4 type of sun lamp showed consistently good results in six experiments during two years and gave positive evidence that this type of lamp was an effective method of providing vitamin D to chickens as compared to cod liver oil. However, they found that, due to the fact that chicks spend a large proportion of their time under the hover during the first four weeks it was more convenient to provide the vitamin D in the mash by means of cod liver oil during the first four weeks and that the cost of doing so was less, also. A test with turkeys up to nine weeks of age showed equally good results regardless of the source of vitamin D. The poults were in confinement.

Experiments with both leghorns and Rhode Island Red pullets, covering a nine months' period, also showed that exposure to the sun lamps for four hours daily was equally as effective as cod liver oil in regard to egg production, maintenance of body weight, rate of mortality, fertility and hatchability. They conclude that the S-4 type sun lamps can be used effectively and with economy to provide the vitamin D factor for growth of chickens and turkeys, for egg production, and for the production of hatchable eggs. As the lamps do not supply vitamin A, they suggest that special precautions must be taken to make sure that ample vitamin A is provided from other sources.

Not Practical or Economical

Assuming equally good results can be obtained when the vitamin D is supplied by sun lamps, it does not seem to the writer that their use under New England conditions is either practical or economical. For each unit of either 100 layers, 200 four to twelve weeks old chicks or forty turkeys, the poultryman must invest $18 to $20. The bulbs are expected to last 1000 hours so their renewal cost is .85 cents per hour. The rest of the parts are given a life of 5000 hours of operation at an estimate cost of .20 cents per hour, making a total of 1.05 cents per hour. The bulb and equipment operate at 120 watts. If three cents per kilowatt is taken as a representative rate, the cost per hour of electricity is .36 cents. The total operating cost is therefore 1.41 cents per hour without including the cost of wiring. It is possible to obtain fortified oil having 400 A. O. A. C. chick units of vitamin D for 40 cents per pound or less. If a sun lamp will take care of 200 broilers from four to twelve weeks of age, the cost of operating it four hours daily for eight week (224

hours at 1.41 cents per hour) would be $3.16. The 200 broilers of the American breeds or Barred Red cross would consume about ten pounds each or 2000 pounds. Four pounds of 400 unit fortified oil would supply an adequate amount of vitamin D and would cost only $1.60 as compared with the $3.16 for the use of the sun lamp. To justify the consideration of the sun lamp as a source of vitamin D the fortified oil would have to cost 79 cents per pound or nearly double the present price. In any case, not many poultrymen are going to change from a mash with oil in it to one without oil at four weeks unless the evidence that they should is very convincing.

Less Favorable

For egg production, the figures are even less favorable to the use of lamps. At forty cents per pound the cost of the fortified oil would be $8 as compared with $20.58 for the cost of using the sun lamp. In other words, the fortified oil would have to cost $1.03 per pound to justify the use of the sun lamp if the production and hatchability were the same. In the Ohio tests, the production averaged 7.9% better in the Rhode Island Reds and 4.7% better in the Leghorns for the nine months' period. There is some question as to whether the increased production and hatchability from the use of S-4 type lamps can be depended upon to make up the difference between the cost of their operation and the cost of using fortified oil. It would seem that the optimum number of layers per lamp needs to be determined as well as the minimum effective length of exposure.

Adequate Supplement

Many poultrymen are wondering about the vitamin A content of the ration. In the Ohio experiments just mentioned there was no supplemental source of vitamin A to that already in the ration, as sun lamps do not provide any vitamin A. There were no indications of Vitamin A deficiencies. The all mash chick starter contained 50% coarsely ground yellow corn and 5% dehydrated alfalfa leaf meal. The all-in-one complete laying and breeding mixture included 20% coarsely ground yellow corn and 5% of dehydrated alfalfa leaf meal as sources of carotene, the precursor of vitamin A.

There is little evidence to show that more than 300 U. S. P. vitamin A units per 100 grams of feed or 1816 units per pound are needed for chicks except in the case of a disease outbreak. For layers, 600 units per 100 grams or 2724 per pound is enough under normal conditions. If long or unsatisfactory storage or feeding conditions are anticipated, twice these amounts probably should be included. However, from a practical viewpoint, there

is little need, under our eastern poultry conditions, for the 3000 vitamin A unit per gram potency which the fortified oils have carried in recent years. Normally, a "400D" fortified oil of not more than 2000 U. S. P. vitamin A units per gram potency will adequately supplement the usual carriers of carotene in the feed such as yellow corn and alfalfa meal, even if there is a storage of the feed during distribution of two months. For feeds mixed weekly and fed fresh, a potency of 1000 units of vitamin A per gram will often be adequate for a fortified oil. No matter what vitamin potency the mash carries normally, in case of an outbreak of colds, coccidiosis or other diseases, added oil to that in the mash is advisable and the sooner it is fed after symptoms appear the more effective it will be.

In conclusion, there is no need for poultrymen to get panicky about the cod liver oil situation. There should be no immediate added cost of feeds as most feed prices have already advanced with the increase in the price of oils. As reliable fortified feeding oils of lower vitamin A potency become available in increasing amounts there could even be a lowering of mash prices. However, if anything happens to cut off Japanese liver and oil supplies, an acute shortage of vitamin D could be expected within six months time, and prices of oils and feeds would advance accordingly.

Early Chicks . . . Are They Profitable?

Condensed from Everybodys Poultry Magazine

Frank D. Reed

University of Maine

ONE of the most important decisions the commercial poultryman makes is his choice of dates for his chicks to arrive. This decision is important because it determines in part the efficiency with which his brooding and laying house facilities are operated, and, most important, the distribution of his production of eggs throughout the year.

The price of eggs, as every poultryman realizes, is seasonal. We have six months (January to June) of egg prices so low that most flocks do little better than pay their feed costs, followed by six months of higher prices (July to December). Now, there should be some advantage in this situation for the poultryman who can organize his business so that his period of great egg production coincides with this period of highest price.

Poultry farm account figures from various states are in general agreement on the effect of a high egg production during the six month period of good egg prices on profits per bird. Figures on 72 flocks in Maine for the season 1939 are given in the table.

How June to December Egg Yield Affects Labor Income

Per Cent of Total Egg Production June to December	Labor Income Per Bird
Under 40%	$1.15
40 to 49.9	1.76
50 to 59.9	1.85
60 and over	2.20

How "Early" Chicks Fit Into Picture

One of the devices for accomplishing this objective of getting more eggs in the high price season is the hatching of some chicks from early December through February. These early hatched pullets commence laying early in the summer and their production curve coincides roughly with the egg price curve. With the old flock depleted in number and down in production, these early pullets enable the poultryman to have plenty of eggs to sell during this season of scarcity. In conjunction with the system of management known as "Barracks" or "Laying Shelter System" whereby the old hens vacate the laying houses to make room for housing early pullets, some poultrymen carry their maximum number of birds dur-

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ing the summer months—but that is another story.

More eggs when eggs are highest in price is the principal argument for early hatching. There are other advantages to be considered however:

1. *Better use of brooding facilities*—these early chicks can be moved to range usually by the first of April, thus enabling the operator to run another lot of chicks through the brooder houses.

2. *Less coccidiosis*—cold weather has an inhibiting effect on the development of coccidia oocysts; poultrymen usually experience much less trouble from this disease in their early lots.

3. *Better broiler prices*—surplus cockerels from the early lots usually bring higher prices when disposed of as broilers.

4. *A longer production period*—a few birds starting to lay in July carry through until the following October—15 months.

Problems with Early Chicks

The very fact that most people wait until April or May to get their chicks is evidence that there are certain problems and disadvantages with early brooding. There are two sides to most questions and here is my list of all the possible disadvantages of early hatching:

1. Early brooding requires better housing and equipment.

2. Early brooding requires more floor space, for chicks cannot be put on range at so young an age.

3. Brooding costs are higher. Since chicks are in confinement for a longer period, feed expense is higher. More brooder fuel, more litter and more labor add to the expense.

4. Early pullets mature earlier, lay peewee eggs for a longer period.

5. Laying house mortality is sometimes greater in early hatched pullets due to the early maturity and the shorter period on range.

6. Early pullets tend to slump in production or go into a partial molt in the fall or early winter.

7. If they carry through this critical early winter period, they may slump the following May or June or lay less during the summer.

Management of Early Chicks

The above is an attempt at presenting a fair picture of the advantages and disadvantages of early hatching. Most people who have had part of their chicks hatched early are well satisfied. Early hatching requires better stock and better management. The following is a brief outline of management as followed here in Maine:

1. *Avoid crowding*. Since early chicks cannot be moved to range until 10 to 12 weeks of age or older, in planning the number of chicks to order allow at least 1½ square feet of brooder house

floor space per chick. Chicks may be started at the rate of 1 chick per ½ square foot, but should be thinned at 4 weeks to 1 chick per 1 square foot. At eight weeks there should be 1 chick per 1½ square feet.

2. *Move pullets to range at 10 to 12 weeks.* Many Maine poultrymen get their chicks on range before the last of the spring snowstorms are over. Shelters are "bagged up" and have wire bottoms to prevent smothering. If snow is on the ground, straw is spread over the area in front of the shelter. Some chicks are put out in this section as early as March 15 and most of the early chicks are on range by the middle of April. How early the chicks are moved out depends upon when the second lot of baby chicks, which will need the brooder houses, is to arrive.

3. *House the early pullets shortly after production starts.* Instead of allowing the early pullets to lay for several months on the range, they are housed when a production level of 10 or 15 per cent is reached. Room in the laying house is provided through culling the old flock or by moving some of the old birds to laying shelters or "barracks" houses.

4. *Provide cool well ventilated laying pens.* Since early pullets must be housed in hot weather, some provision for comfort must be provided. These conditions are best provided by insulating the ceiling and by opening the front and rear windows.

5. *Prevent the fall molt.* The tendency of early pullets to go into a partial molt with the approach of shorter days and colder weather may be partially overcome through the use of lights. Start lights by October or earlier, allowing a 13-hour day. Check body weight carefully. It is usually necessary to start wet mashes or pellets in October or November. Breeding is an important factor also.

6. *Avoid heavy culling in the fall and winter.* Even in cases where a severe fall molt occurs, we usually feel heavy culling inadvisable. These birds will come back and may make up for their vacation later in the season. We usually postpone heavy culling until July, at which time birds are removed as they cease laying. Culling for health is, of course, necessary all the time with any lot of birds.

7. *Management the following summer* is the same as for any group of old birds. Culling may have to be heavier. If birds are not intended for breeders the following year, lights at 3 A.M. in July or August will help to maintain summer production.

Fencing To Fit Round Farming

Condensed from Missouri Ruralist

Cordell Tindall

THERE was a time when square fields, perfectly laid off, with fences running straight for the length of the farm was a sign of good farming. Now many of the best farmers prefer fields resembling more the pieces of a jig-saw puzzle.

It would appear that the day of the quarter section divided up into perfect squares into 80's, 40's and 20's is waning. They still make a pretty picture, especially in country where hedge fence is the vogue. But the many thousands of farmers who are turning to contour farming are finding they don't fit into the system of farming their land "around the hill."

Never has a soil conservation practice caught the popular fancy like contour farming. You can talk to thousands of its advocates who will tell you of higher yields, slower erosion, less fuel for tractors, and even easier work.

The reasons for its immense popularity have become pretty obvious, and first among these is the low cost of the system. It doesn't cost any more to farm on the contour than it does up and down the hill. Terraces cost money, strip-cropping is less convenient, and gully structures take time and materials to build. But with a dollar level, anybody can go out and plant corn around the slope of the hill.

And so these men who have tried contour farming and found it to their liking are looking at their old square fields. It's like trying to fit a round peg in a square hole, to use an old, familiar expression.

Certainly, with the many farmers feeling as they do about contour farming, they are going to want to remodel their farms to fit in with this new system.

Oddly enough, little information can be found by the man who wishes to change his fencing and put it on the contour. Agencies that have been talking contour farming for years supply little help in solving the problems that confront the man who wants to string his fence around the hill.

We went to the Soil Conservation Service connected with the CCC camps for our answers to this problem. We were referred to Marion county for some good examples and, there, K. R. Peterson, with the Soil Conservation Service, showed us around. The camp has moved on, but work is

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still being done with the men who signed up as co-operators.

One of the finest examples in the state of remodeling a farm to fit in with contour farming has been done by William Glendinning, of Palmyra, with the help of the Service and the camp. Mr. Glendinning is a veteran of many years of farming and has seen a lot of water run off his farm, so to speak.

We stood with Mr. Glendinning on the highest point of his farm and looked out over the sweep of his field. Here was indeed a typical Missouri farm, if we ever saw one. There was a decided roll to the land, and it was easy to imagine what ravages erosion could make on this farm if allowed to run rampant. There were the usual crops growing, corn, wheat, legumes, pasture. There was livestock.

"Back when I bought this farm I tried to put in my fences to run as straight as possible," said the host, "But I have had to change my notions some.

The two maps of Mr. Glendinning's farm show better than words what moving a few fences has done in changing the shapes of the fields.

No rules can be laid down for contour fencing. Those who have put in the fences say that a complete plan for a farm cannot even be worked out on paper or on a map.

The general idea is to get the fields so arranged that they fit in with contour farming. This means that the fields be of the same slope as much as possible. Mr. Glendinning has one field that illustrates this. One wide sweeping slope formerly was divided into three fields. Now it is only one. When farmed on the contour now there are fewer short rows. And this does away with about the biggest objection to contour farming.

Mr. Peterson told us of one farmer, who by rearranging his fields on the contour now has the longest rows he has ever had. This is often the case.

Another of the objects of rearranging on the contour is to pay the most attention to the shape of the fields to be cultivated. Then the permanent pasture can be left just about any shape desired.

The laying out of any individual farm depends entirely on the lay of the land, the system of farming followed and the arrangement for convenience. No set rules can be laid down.

Naturally, few of us can completely revamp our entire fencing system all at once. But as we put in a little each fall and spring we can be arranging it with a complete plan in mind so that some day the entire farm will be laid off for convenient contouring.

Now as to the actual construction of the contour fencing. The

posts are not set on the exact contour line. Good fencing has to be put on a straight line, even in contouring it. Actually, the fence is put in with short, straight sections. The length of these sections will depend on the curve of the contour line.

In building and stretching these lines, each section must be treated as a unit. That is, each section of straight fence, no matter how short or how long, is braced as a unit and stretched as an individual unit.

Fence put in by the CCC camps in the Marion county area appears to be holding up well. Of course, one of the first secrets in building good fence is to have good materials. Good posts, whether steel or wood, are half of the job.

The Soil Conservation Service recommends two corner posts at each end of each section of contour fence, no matter how short the section. Where the fence makes a turn then you will find four corner posts, the two independent of the other two.

Between these corner posts makes a good place for a gate in contour fencing. Where one is not needed, however, the wire can just be stretched slack between the two end corner posts.

In the Marion county area, parallel bracing has been used between the two corner posts. It is thought this will prevent pulling the end post out of the ground. It seems to be working, but, of course, sufficient time has not yet elapsed to give this method a final test. A diagonal wire is stretched tight as added bracing.

In some cases the parallel brace is placed halfway between the ground and the top of the post; in other cases the brace is nearer the top. One of the advantages of this parallel brace given by farmers is that in not being so near the ground it does not rot so soon.

This parallel brace is also mortised into the corner posts, in some instances. This keeps it from slipping. The only disadvantages in contour fencing are that more corner posts are needed and more stretching is necessary.

Contour fencing also is used to enclose areas that are badly eroded in an effort to salvage or reclaim the soil. Tree planting areas often are enclosed with contour fencing. However, this use of contour fencing is different from that described and it has different problems.

In recent years a new type fencing has appeared—electric fence. Its use has become widespread and it adapts itself very well to contour farming.

With electric fence it actually can be put up exactly in the contour lines around the hills.

Charles Schaffer, of Higginsville, in Lafayette county, is an

advocate of both electric fencing and conservation measures in farming. He has worked out a system of pasturing his contoured fields with the use of electric fence.

Mr. Schaffer has been doing terracing and contouring for a long time. All of the cultivated land of his 250-acre farm is protected against soil erosion.

All of this land, except the permanent pastures, is fenced with electric fencing. His house sets back from the road in the center of his farm, and he has his central control box in the basement. Radiating to all parts of the farm go the charged lines.

Mr. Schaffer has substantial corner posts erected and leaves them there all the time, altho the wire is taken down and put up as needed. Mr. Schaffer does not try to fence sheep with this electric fencing, only cattle and hogs.

Other farmers, Mr. Glendinning being one of them, take pride in their well-constructed, permanent fence. His fence rows are neat and clean. His posts are of good quality and well set. The wire is tightly stretched.

Certainly, well-built fence of this kind does much to the appearance of the farm.

Tractor Costs vs. Horse Costs

Condensed from The Michigan Farmer

F. M. Atchley

Farm Management Department, M. S. C.

ABOUT one-third of the farmers in Michigan have tractors. There are also nearly two horses for every farm in Michigan. Which of these two types of farm power is the most economical? This question is asked over and over again.

Both horses and tractors have their place on Michigan farms—perhaps not both of them on all farms, but they both certainly have a place in Michigan's agriculture. It is true that some farmers in Michigan farm without horses, using a tractor for grinding feed, hauling manure, buzzing wood, hauling hay, plowing, discing, dragging, combining, cutting corn, filling silo, and all the other odd jobs for which power is needed around a farm.

The distribution of the various costs of maintaining horses and

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tractors shows that 53 per cent of the costs of keeping tractors are fixed charges (depreciation, interest and shelter) while only 25 per cent of the horse costs are fixed (see table). This is due to the relatively high money value of the tractor on which interest and depreciation are charged.

The big differences are the greater amounts of labor used in caring for the horses and the larger depreciation and interest charges on the tractors. This information was obtained from records kept by farmers in Michigan in co-operation with the M. S. C. farm management department.

These records also showed that the total annual cost of keeping 1-, 2-, and 3-plow tractors in 1939 was $187, $243, and $301 respectively, while the net cost of maintaining a horse for the same year was about $75. There was an average of 3.2 horses per farm on the farms keeping horse records in 1939 which would mean that the total cost of horses on these farms was about $240 a year.

The horse records that were kept during the 3-year period 1937-1939 were divided into two groups—those farms that maintained a tractor and those that did not. This division of the records showed that the farms with tractors had a net horse maintenance charge per farm of $281, while the farms that did not have tractors had a net horse charge of $325. The tractor farms averaged 33 acres per farm larger than the non-tractor farms. If we assume that it would cost about $250 a year to operate a tractor on the tractor farms, the annual cost per acre would be about $1.38, making the total charge for the additional 33 acres amount to about $46. The $44 difference in horse charge plus the $46 difference in tractor charge because of size of farm would certainly not pay for operating a tractor a year. Furthermore, a study recently conducted by Dr. K. T. Wright, of this department, showed that tractor farms tend not only to be larger, but also tend to be operated with about 12 per cent more efficient use of man labor during relatively normal times. It is usually expected that a tractor should reduce the amount of labor needed on a farm. Dr. Wright's study showed that labor efficiency and crop yields were both increased when adequate power was maintained.

The hourly costs for tractors and for horses vary with the number of hours of use and the total yearly expenses. The total hourly costs for the 1-, 2-, and 3-plow tractors in 1939 were 44 cents, 51 cents and 59 cents respectively, while the net cost of working a horse one hour in the same year was slightly more than 10 cents.

The 2-plow tractor records were sorted into three groups according to how much the tractors were used. The group of tractors used the least, averaging only 149 hours in the year, averaged 10 years old, were valued at only $223 each and cost their operators 63 cents an hour. Those used an average of 426 hours averaged 2.1 years old, were valued at $804 each and cost 57 cents an hour, while those tractors that were used an average of 757 hours in the year averaged 1.4 years old, were valued at $896 each and cost only 47 cents an hour to operate. In the same manner the horses that were worked an average of 495 hours a year during the 3-year period of the study cost a little more than 18 cents an hour, those averaging 687 hours cost a little more than 14 cents an hour, and those worked an average of 1,122 hours in a year cost only slightly more than 8 cents an hour.

From the parts of these studies dealing with hourly costs, it isn't hard to see that idle tractors or an idle tractor are expensive items around a farm. If you haven't enough work on your farm to keep horses and tractors pretty busy you probably have more power than you are using efficiently. Some of you farmers who are keeping a tractor as well as several horses had better study your power needs in some detail.

COMPARATIVE COSTS

Relative importance of various items of cost on 2-plow tractors (1939) and on horses (1937-1939) in Michigan.

Items	Percentage distribution of costs on: 2-Plow Tractors	Horses
Operating expenses:		
Fuel or feed	34	47
Man labor	2	21
Repairs and lubricants	11	..
Bedding	..	4
Other	..	3
Total	47	75
Fixed charges:		
Depreciation	35	12
Interest	15	6
Shelter	3	7
Total	53	25
Total operating and fixed	100	100

Improved Herd Efficiency Through Artificial Breeding of Dairy Cattle

Condensed from Certified Milk

J. W. Bartlett, Ph.D.

New Jersey Agricultural Experiment Station, New Brunswick, N. J.

TO report the progress of artificial breeding of cattle in this country would require almost a daily statement on the research that is being attempted and the practical application of its results.

In the two and one-half years since New Jersey dairymen formed a cooperative association for the employment of a trained veterinarian to inseminate cows for about one hundred of its members, over 20 cooperatives have been inaugurated in several of our states. The 1,000 original cows in New Jersey have now increased to six times that number in the state and the first calves born from the artificial method will soon give birth to calves from artificial insemination.

While the expansion of cooperative artficial breeding groups has been very great, its success has not been without some misgivings. This report, therefore, will deal with some of the things which seem safe to practice and some of the things which should be avoided.

There appear to be four important essentials necessary to the successful operation of a cooperative artificial breeding association. They are:

1. An intense interest in herd improvement by the members and enough cows enrolled to insure sufficient finances.

2. Exceptional sires available for use. At least half of these should be highly worthy proved sires.

3. A competent technician, preferably a veterinarian, with a knowledge and sympathetic understanding of dairymen's problems.

4. Reasonable patience. Some members are inclined to become panicky if it happens that the first two or three cows do not conceive on the first or second insemination. The fault usually is that the owner does not realize that the breeding efficiency in his herd has been low all the time.

Early in the expansion of this program for artificially breeding our herds the progress ran ahead of the scientific facts which were

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available concerning the physiology of reproduction in cattle. We knew what happened in a normal herd of 20 to 50 cows where 1 to 3 bulls were used but we didn't know too much what would happen if we used a bull two or three times a week over several months.

Some early observations were that variation in insemination rate per pregnancy was not confined to mature bulls. Some young bulls were not only low in rate per pregnancy but varied greatly in the amount of semen per ejaculate and length of motility of sperm. Bulls used infrequently often gave semen devoid of sperm in the first ejaculate. After a few weeks of heavy service many bulls suddenly became practically sterile. With a group of dairymen having 1,000 or more cows to be bred, such problems were serious.

In New Jersey we quickly learned that exercise allowing the bull to walk about 40 minutes to an hour a day, nearly doubled the semen per ejaculate. We had constructed and use regularly an electric exerciser in our central bull units. We feel they are essential. Wisconsin has found the bull exerciser so satisfactory that their bulls are now being kept in tie stalls all the time except when out for exercise or tethered on pasture.

Recently, Dr. Philips at the Wisconsin Station has had remarkable success in bringing sterile bulls back into full service by the subcutaneous injection of ascorbic acid (vitamin C). He has found that apparently there is a relationship between the vitamin C content of bull semen and blood plasma and the potency of the semen. Semen which has a sperm motility of 100-200 hours gives a much higher conception rate than semen with a sperm motility of less than 100 hours.

At the present time we are keeping a frequent record of the ascorbic acid content of the semen and blood plasma of each of our bulls and all bulls are tested before going into service in any breeding unit.

A new dilutor, composed of equal parts of fresh egg yolk and a specially prepared phosphate buffer has made it possible to store semen safely for two to three days. This has reduced the necessity of using bulls so often, thereby permitting resting them from 3 to 5 or 6 days—or longer if more than two are in regular service.

Insemination during the full and late oestrum or heat period has shown the highest rate of conception. Full oestrum is one which has progressed 8 to 12 hours.

Green feed seems to have properties valuable to a breeding sire. Where bulls are exercised regularly they may be handled

easily and a common practice is to tether them in good pasture. Wisconsin has found that a metal barrel or drum filled with sand and with rings on either end for tying the bulls is an excellent thing. Active bulls roll the heavy barrel enough to get some exercise.

The central bull barn with a good caretaker is accepted as the best system for efficiency. New York State has now located several of their superior bulls at a central unit near Syracuse and are dispensing semen to technicians at considerable distance by train and motor.

The New Jersey Unit No. 1 now has three veterinarians working from a central barn. One veterinarian looks after breeding calls near the barn and takes care of the bulls; thus the sires are constantly under the supervision of the best talent. The need of a sound breeding program was not at first recognized but now units are attempting to secure sires of related ancestry and are using young sires on fifty to one hundred cows and then retiring them until proved. This problem is going to be a serious one, for with fewer bulls in service we are going to find it more and more difficult to secure the bulls with the proper production index. The New Jersey units are depending upon the College to supervise a breeding program and lease sires of known production.

Dairy farm hygiene is very necessary to good fertility in our milking herds. Some form of reproductive irregularity has been found in at least 75 per cent of the cows in our cooperative units. There are a few units where a veterinary supervising service has been initiated on a flat fee basis. Such a program has a great amount of merit and should produce a higher breeding efficiency on the farms where practiced.

It would seem that the cooperative plan of artificial breeding of dairy cattle is rapidly being accepted as a sound economic practice for the average dairyman. For $5 or $6 he is able to secure a calf from sires which have fat producing indexes of 500 to 700 pounds,—some of them even better. In a herd of 20 cows this is an annual cost of $100. It would cost many dairymen that much to feed a bull to say nothing of the investment of which he is relieved.

These breeding programs are going to be sound; they must be to succeed. Therefore, the average dairyman has been elevated to the same plane as the breeder. He is using proved sires, generation after generation. Much of the hazard of inferior bulls has been eliminated.

The disease problem has been placed under control. The toll of sterility has been a serious and economic problem for a long

time. Under the artificial breeding plan it can be overcome.

One method whereby the dairyman may increase his profits is by reducing his costs. It would seem that the cooperative artificial breeding unit is offering him an opportunity to do this very thing.

Swine Quiz

Reprinted from The Duroc News

PROPER care and feeding of the brood sow is important for success in hog raising. The following questions, which often arise in this connection, are based on Minnesota Extension Bulletin 74, "Care and Feeding of Pigs." Test yourself. A good score is ten correct but an expert hog man should answer all correctly. For answers see page 73.

True, False, or Check

1. Corn is superior to alfalfa as a body-building feed for hogs.————

2. Long-bodied sows farrow larger litters than short, thick-bodied ones.————

3. A sow farrows (a) 90, (b) 112, (c) 283 days after breeding. (Check correct one.)

4. Bred sows should not be made to exercise during the cold winter months.————

5. Green, leafy hay is a satisfactory feed for cattle but not for hogs.————

6. Litters of weak pigs are often caused by a lack of protein in the sow's ration.————

7. Grain feeding should be increased a few days before farrowing.————

8. A farrowing sow should have lots of long hay or straw as bedding in her pen.————

9. A sow should not be fed for 18 hours after farrowing.————

10. Pigs born in March usually bring higher prices than those born in May and June.————

11. Soybeans should not make up a major part of the hog ration because they produce (a) liver troubles, (b) crankiness, (c) soft pork. (Check.)

12. The best time to treat a sow for lice is soon after farrowing.————

13. Suckling pigs can be supplied with iron by giving them a few shovels of clean dirt.————

Fertilization of Pastures and Legumes

Condensed from Armour

S. D. Gray

Northeast Manager, American Potash Institute, Inc., Washington, D. C.

PASTURES constitute the greatest undeveloped resource in American agriculture. They have had a profound influence on the development of the livestock industry, the margin of profit in most phases of this industry being dependent upon the extent to which good pasture is utilized. Fertilization of good pasture to keep it good or of below average pasture to restore it to a satisfactory level of production is a wise investment on any soil suited to the growing of grass and clover.

While pasture use has contributed much to the success of livestock farming by supplying a cheap and highly nutritious feed, it has been largely at the expense of the virgin fertility of of the soil. Continuous removal of the mineral plant-food elements, lime, phosphorus, and potash, in the meat, milk, and wool sold off the farm without replacement by fertilization has reduced yields and increased cost for barn feeding to a point which seriously lessens economic production.

It is estimated that our livestock population consumes three-fourths of the products of our improved farm land. In addition, it uses practically all of the products of the humid and arid grazing lands of all descriptions. More than one-half of the forage requirement is supplied by the 231,000,000 acres of humid grassland pastures representing approximately one-fifth of our entire grazing area. Our animal population at the present time is approximately 90,000,000 animal units. These animal units are an economic asset only in so far as they can be efficiently fed.

The carrying capacity of many of our pasture lands is ridiculously low. A study of the statistics on this subject reveals that on the arid and semi-arid ranges from 25 to 100 acres of land are required to support one full grown cow or steer. In the humid regions where moisture is not a factor and where the soil fertility is still such as to support a fair growth of herbage, about 5 acres are required to support one animal unit. An examination of records on carrying capacity of pastures in important European countries shows that the number

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of acres required to carry one animal unit ranges from .91 in Belgium to 2.65 in Great Britain and Ireland. Corresponding figures from Germany, Denmark, and the Netherlands are 1.24, 1.46, and 1.60 respectively.

Pastures in the humid regions of the United States have gone through several distinct stages of impoverishment, each followed by lower production of forage of inferior quality. Depletion of the supply of lime and phosphorus is usually the first stage encountered and is usually reflected in a less vigorous growth of the grasses and legumes. This is followed by the exhausion of potash, disappearance of legumes, and the appearance of inferior species of grasses, weeds, moss, and finally brush. In the first stages of soil fertility exhaustion, the use of phosphorus alone or with lime is likely to be sufficient to bring back the clover and through its growth help maintain the nitrogen supply. Most of our permanent pastures in the humid area probably passed the first stage of fertility exhaustion more than a generation ago. They are now, therefore, about equally deficient with respect to potash, organic matter, and nitrogen.

Results of fertilizer experiments on pastures have been on the whole impressive and clear-cut. Quite generally they have emphasized the importance of liberal fertilization. While authorities are agreed that phosphoric acid is almost universally deficient and consequently the basis of any successful treatment, repeated tests have shown that it is not always a sufficient treatment. Evidence is accumulating from experimental work in widely separated areas showing that potash is frequently quite as necessary as phosphoric acid. These data also have stressed the relationships of lime to efficient utilization of phosphorus and potash.

Typical of the research findings with respect to pasture fertilization are recommendations recently emanating from the New Jersey Agricultural Experiment Station from which we quote: "On farms with limited acreage a greater net gain to the farm might be obtained from the more intensive system of fertilizer treatment. On farms with more adequate acreage, however, the treatment with lime, phosphorus, and potash which brings in clover would be the most profitable. Perhaps the best system on many farms would be the use of heavy nitrogen fertilization balanced with lime, phosphorus, and potash on a part of the pasture for early spring grazing and the use of the straight mineral treatment, lime, phosphorus, and potash to stimulate clover on the remainder of the farm."

A shortage of either phos-

phorus or potash, or both, is often a primary cause of poor clover growth, according to the Pasture Production Manual published by Mississippi State College, and where they are lacking as indicated by present or previous crops, these minerals should be applied before reseeding old pastures or seeding new ones on depleted soil. Muriate of potash should be applied at the rate of 100 pounds per acre, and superphosphate at 200 to 400 pounds per acre, or 500 to 1,000 pounds of basic slag per acre, the manual suggests.

While the recommendations of the different Experiment Stations vary with respect to the fertilization of pastures, they are, generally speaking, in very close agreement on the matter of major objectives and practical management practices. Supplementing the excellent experimental programs in the several States where pastures are important are the Extension demonstration programs taking the results of research direct to the farms of the nation.

Pasture improvement demonstrations were conducted in 45 counties in Indiana during the past year. From 26 of the demonstrations on which records were secured, results show that permanent pasture definitely responded to plant-food treatment.

Phosphoric acid only increased the average yield 36%, phosphorus plus manure increased the yield 48%, phosphorus plus potash 47%, and complete fertilizer 69%. In all of the demonstrations lime was added where needed.

Results of 34 pasture experiments in Ohio during 1933 calculated on the basis of equivalent production per acre in pounds of beef and milk gave for the O, P, and NPK treatments respectively, 111, 203, and 389 pounds for beef and 1,080, 1,983, and 3,789 pounds for milk. In terms of cost of pasture per 100 pounds of beef and milk, the figures for the same treatments were $4.05, $2.96, and $2.71 for beef and $0.42, $0.30, and $0.28 respectively for milk. Whether calculated as per acre production or cost of pasture per 100 pounds of beef or milk, the economic returns were significantly favorable for each fertilizer treatment.

Pasture top-dressing tests on 103 farms in 15 States and the Province of Ontario were reported by the National Fertilizer Association in 1930. Average results expressed in terms of dry matter and pounds of protein per acre present one of the most convincing pictures for fertilization that has been made available. Yields from the O, P, LP, LPK, and LNPK treatments were 1,051, 1,392, 1,548, 1,850 and 2,501 pounds dry matter per acre. For the same plots the yields of crude protein per acre were 171, 235, 266, 344, and 488

pounds. On 50 of these farms where accurate records were kept, an average application of fertilizer costing $15.14 per acre returned an average net profit of $29.62, or in other words, 195% on the investment in 6 months. Decreased feed costs and increased milk production practically paid for the cost of the fertilizer before the unfertilized pasture was ready to graze. In the opinion of those who conducted these tests, the use of high analysis fertilizers offers the dairy farmer quicker returns than any other investment he can make.

Pastures are recognized as being the best and cheapest source of protein feed. In the young tender stage pasture grasses contain more protein than alfalfa hay, about twice as much as mixed clover hay. Cost of this protein is about one-third as much as in purchased feed. It is quite clear from the experimental work that has been reported that both the yield of dry matter as well as the protein are greatly increased by proper fertilization.

White clover is sometimes styled as the key to pasture improvement. By many authorities it is regarded as an excellent indicator of mineral deficiencies. When it fails, it is a reasonably sure sign that the supply of potash, phosphorus, and/or lime is deficient. Importance of mineral plant food in increasing yield and quality of herbage as well as for the health and productive capacity of animals gives a high degree of significance to this type of fertilization. A deficiency of minerals is usually associated with deficiency of protein and absence of properties such as leafiness and succulence on which the nutritive value of pastures depends so much.

The old axiom "take care of the legumes and the grasses will take care of themselves" is being put into practice throughout the humid areas of the United States. The big problem in this connection is quite naturally that of supplying the necessary minerals, lime, phosphorus, and potash before planting the legume. The second most important probably is that of selecting the legume best suited to the particular soil and climatic conditions. White clover, the premier legume for growth in association with grasses does best under cool, moist growing conditions. In areas that are subject to drought, such as in our Midwestern States, white clover has been largely replaced by the deeper rooted legumes, alfalfa and sweet clover. In the South and Gulf Coast States, a number of shallow rooted legumes have been tried out. Among the best for use in pasture mixtures have been the White Dutch and Persian clovers for wet soils and on the well-drained soils, species, such as the California burr, sweet clover,

black medic, and little hop. Of one thing we are quite sure and that is for almost every condition or section of the country where pastures need to be grown, there is a legume well suited for pasture uses. In practically all cases it has been found that these clovers are highly responsive to mineral fertilization.

No discussion of pastures would be complete without some mention of the part they play in soil conservation. As a means of protecting soil against erosion, pasture is universally recognized as the best form of land occupation except wood land.

There is probably no other means of so greatly reducing the cost of production of livestock and livestock products and so greatly increasing the net farm income as through the improvement of farm pastures. The development of a satisfactory soil-fertility program for the maintenance of the fertility of pasture soils is the surest means of making pastures the greatest agricultural resource of our country.

Answers to Swine Quiz

(Questions on Page 68)

(1) False. (2) True. (3) 112 days. (4) False. It is a good idea to feed them some distance from the pen so that they get exercise. (5) False. Sows should be fed all the green, leafy hay they will eat. (6) True. (7) False. Grain should be cut down. A slop of half bran and half shorts mixed with water is good at this time. (8) False. Little pigs may get trampled or entangled in long straw. Chaff or shredded corn stover is good bedding. (9) True. (10) True. (11) Soft Pork. (12) False. Treat before farrowing. (13) True.

Breeding for Consumers

Condensed from Sheep Breeder

J. F. Walker

OVER the entrance of the Smithfield Fat Stock Show in England is placed this sentence, "The man who pays the fiddler has the right to call the tune—Give the customer what he wants, not what you think he ought to have."

Here is a statement that our breeders would do well to think about. How often do we hear pure bred livestock men talk about what the customer wants. How often are animals placed in the show ring with the idea of emphasizing modern demands in the way of meats? How many judges do you hear discussing the percentages of high priced cuts found in the animals coming before them?

One hears a lot about style, covering, and type—but how much do we hear about how the animal will dress out and how it will attract the ultimate purchaser?

Over in Denmark a type of hog, the "Landrace," has been developed that stands out preeminently as the most acceptable hog of the present time. In a conversation with a Dane who played some part in developing the Landrace, the question was asked as to how the results were achieved. His answer was: "The most valuable cuts in a hog are the side for bacon, and the hams. We started to think of hogs in terms of sides and hams and excluded everything else not essential in producing them. The Landrace was the result."

What would happen to the American sheep industry if all breeders began to consider sheep in terms of backs and rear quarters carrying a fleece of the right quality and reasonable weight? This question was put to a prominent breeder and he replied, "This would never do. Why in a few generations of following such a program of breeding, all breeds would look alike, and there would be no distinct breed types." Here was a breeder whose thoughts were directed in breeding for breeders rather than breeding for consumptive outlets.

This man's position is by no means an isolated one, nor is it confined to breeders alone. At the recent International the carcass winners showed in nearly every instance an exclusive loading of fat. The judge was thinking in terms of high dressing percentages and failed to consider

Reprinted by permission from the Sheep Breeder, Jan., 1941, Chicago, Illinois

the consumer reaction toward a mutton chop of which at least 50 per cent was waste from his viewpoint. Had the judges stood around and listened to consumer reactions to their choices they might have altered their decisions somewhat.

Over in the sheep barn one heard men say, "They have taken out the yearling wether classes, now we ought to have a light weight class of wether lambs and a heavy weight class, drawing the dividing line at around 95 pounds." Where today is there an acceptable outlet for lambs over 95 pounds except to restaurants and hotels? The New Zealander, whose Canterbury lamb is the world's standard of quality, tries to get his lamb finished at 34 to 36 pounds dressed. We may stretch those weights somewhat but hardly up to carcasses dressing 50 pounds or above.

Adopting a classification for wethers that would only consider the most acceptable market weights might work a hardship on some of the larger rapid-maturing breeds. One wonders whether these breeders are not hurting themselves by showing lambs decidedly over weight and being forced to take considerably less per pound for them.

The situation of the breeder of our larger breeds at the International is an unfortunate one. He is producing a lamb that normally would be on the market, at the proper weight, when some three to four months of age. That means his crop of lambs goes to market generally from June to August. He must either have a few late-dropped lambs to bring on, or show an excess weight if obliged to show earlier ones. This is a problem the breeders will have to solve themselves. One thing certain, so long as classes are provided, some one will try and fill them.

The consumer of lamb wants chops and hind quarters that are not too large. What is more, he proves his wants by the money he will pay, and most of us raise sheep for the money they will bring. He wants all the chops possible. He wants a leg of lamb preferably around six pounds in weight. He is not partial to excess bone and neck. As a consumer he is interested in only enough neck to attach the head to the body and only enough head to properly masticate the food.

The consumer of wool wants a uniform quality fleece to prevent a lot of off sorts wool. He wants it of reasonable length and the producer is interested in securing as many pounds of wool as he can without sacrificing carcass.

A uniform fleece is also desirable from the producer's standpoint as it indicates uniform fleshing. A hard bone, fine in quality, indicates meat fine in grain as well as less wasty.

Given lambs of this quality, properly finished at acceptable weights and consumer demand for lamb will show marked increase and prices will move to higher levels.

It is doubtful whether wool will ever again demand high prices over any protracted period of time, owing to substitutes. So far no substitute for a good leg of lamb or a well prepared chop has been found. Why not capitalize on this potential market?

Kansans Learn Substitutes for Corn

IN a discussion on the Kansas Swine Feeders' Day at Kansas State College last fall, Dr. C. W. McCampbell brought out the fact that corn is not essential in the production of good hogs or good pork. He said that by depending upon grains other than corn, Kansas hog raisers could materially increase their hog production. The difficulty in creating active interest in other grains for feed is the tradition that has grown so strong in this country on the corn-hog combination.

In discussing other grains for feeding, Dr. McCampbell pointed out that wheat is probably the best grain one can feed if the price compares favorably with hog prices. In tests conducted at the Kansas Station, wheat-fed hogs gained the same as corn-fed hogs and used slightly less concentrate per 100 pounds of pork produced when fed with alfalfa pasture. In the dry lot, the wheat-fed hogs out-gained the corn-fed hogs and used less protein supplement per 100 pounds produced.

However, the sorghum grains are probably the best grains for Kansas feeders to use in increasing this hog production, Dr. McCampbell said. The feterita and kafir sorghum grains when ground are worth from 85 to 95 percent the value of shelled corn in the hog ration. Tests have shown that it is best to grind all sorghum grains for hog feeding. Hogging down sorghums is wasteful and unsatisfactory, said Dr. McCampbell. Also the grain of the forage sorghums is not recommended for hog feeding since it is only 77 percent as efficient as corn.

Barley is another grain that is becoming more important as a hog feed, Dr. McCampbell said. It produces excellent quality pork and is very good feed if ground when fed. Rye is another grain that can be satisfactorily used as a part of the concentrate ration but should not be fed alone, he said. —*Duroc News*

Nitrogen Industry Ready for National Defense

Condensed from The Fertilizer Review

WHEN our forefathers struck West from the Atlantic coast to settle a virgin continent, there was land galore awaiting their occupancy. Ever ahead of them beyond the horizon stretched miles of rich prairies and forests. The amount of land seemed endless, its fertility inexhaustible. They put the plow to this untouched soil. None thought of the fact that it had taken geologic ages to build the top soil or that it had taken countless centuries to make available in this soil the plant food upon which the first crops feasted.

Even with the harvest of the first crops, there was taken from the land a measure of its plant food. Each successive crop took more of it. Perhaps the first element to vanish from the virgin soil was nitrogen. The nitrogen in the soil available to plants had been accumulated there through the centuries by the decaying plants, leaves, and roots and from rain and snow. When this element became deficient or was exhausted, it was necessary to supplement or replace it by applying rotting organic matter or commercial fertilizers.

As early as 1824, the necessity for the replacement of nitrogen taken from the soil was recognized by the fact that the first importation of fertilizer materials to this country—two barrels of guano—was shipped from Peru in that year. Since this early date there has grown a vast industry producing nitrogen-bearing materials for fertilizer use.

The consumption of nitrogen in the United States as a plant food in 1939 amounted to 384,424 tons, about 52.6 per cent of which was used in fertilizer mixtures, and 47.4 per cent applied directly to the soil as unmixed materials. Commonly used nitrogen carriers include: (1) sulphate of ammonia; (2) nitrate of soda; (3) ammonia liquors; (4) cyanamide; (5) natural organics; (6) a variety of other materials used on a smaller scale.

Sulphate of ammonia, produced in the 88 coke plants of the country as a by-product, was manufactured last year to the extent of 676,800 tons, while 110,761 tons were imported.

From beds of caliche, in Chile, as much as 25 per cent nitrate of soda may be extracted by dissolving it in water and crystal-

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lizing the nitrate of soda by evaporation.

The largest potential source of nitrogen, however, is not the distant beds of nitrate of soda nor the guano deposits of ocean islands. The chief source is the air.

Tapping of this unseen reservoir of fertility is done by methods developed early this century and expanded during the period of the late World War when other sources of supply were impaired.

The capacity for nitrogen fixation in the nine domestic plants of this country equipped to take it from the air is estimated to be about 375,000 tons of nitrogen a year. A considerable portion of this is assigned to the production of chemicals and explosives. At least three additional nitrogen fixation plants are included in the National Defense Program to produce nitrogen compounds for explosives. One of the presently operating nitrogen fixation plants produces synthetic nitrate of soda at an estimated rate of approximately 400,000 tons a year, about one-third of which is used as fertilizer and the balance for chemicals and export.

The outlook for increased production of most raw materials is promising. Demand for more coke for increased steel production will increase production of the by-product sulphate of ammonia. There seems little likelihood that importation of nitrate of soda from Chile will be interrupted. Cyanamide is imported from Canada, but the United States has always been the main outlet and will probably continue to be.

The natural organics are mainly by-products of human food production, vegetable meals from edible oil manufacture, animal and fish tankages from packing houses and canneries. As increased quantities of food are produced for defense purposes, manufacture of their by-products will increase. These factors, coupled with almost unlimited ability to construct and operate plants for the fixation of atmospheric nitrogen, seem to make secure our nitrogen supply for agriculture.

We have within our own boundaries potential capacity for complete independence as to our needed plantfoods. Good neighbor policy in the Western Hemisphere makes it desirable to continue importation of nitrate of soda from Chile and cyanamide from Canada, and there seems to be no reason why such importations cannot continue. No plant food problem seems to face us as a nation.

Making Poultry Pay

Condensed from The Southern Planter

Dr. Morley A. Jull

Head of the Poultry Department, University of Maryland

THERE is money in the poultry business if one goes about it in the right way. Most poultrymen can be divided into three groups: First, those who are interested primarily in the production of market eggs; second, those who are interested almost exclusively in the production of broilers; and third, those who are interested primarily in turkey production. With good stock and with proper management there is money to be made in each of these branches of the industry.

As a matter of fact, most flock owners are chiefly interested in the production of market eggs, although many of them produce hatching eggs which they sell at a premium and a few of them produce baby chicks. Since market egg production is of interest to a great majority of flock owners, this article is devoted to the problems affecting profits in that branch of the poultry industry.

Good stock and efficient management are absolutely necessary in order to make money nowadays in the production of market eggs particularly since feed prices are relatively high and egg prices are relatively low. There are at least six important factors that determine the profit or labor income that can be obtained from the flock whether it be large or small. These six important factors are:

1. High yearly egg production.
2. High fall egg production.
3. Low mortality.
4. Efficient use of labor.
5. Low overhead costs.
6. Good volume of business.

The most profitable flocks are those that excel in all six of these factors. Some flock owners have good stock that are bred for high egg production but are poor managers and, therefore, do not secure good returns. Other flock owners are efficient managers but do not have good laying stock and, therefore, do not secure good returns. Still other flock owners have good stock and are efficient managers but their overhead costs are too high. A combination of all six factors is necessary if the greatest profits are to be made out of the flock.

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High egg production is essential to good earnings from any flock. The pullets raised each year must be from bred-to-lay stock and in order to keep up efficiency of production the flock must be culled regularly, artificial lights should be used during the fall and winter, the best of feeding methods must be practiced, and the flock owner must be on the alert at all times to keep down mortality.

The results of a survey conducted recently in Connecticut showed a significant relationship between average egg production during the first laying year and the labor income obtained per flock. Those flocks which laid an average of less than 150 eggs per bird produced an average labor income of $511 per flock. Those flocks that averaged about 165 eggs per bird produced an average labor income of $1,023 per flock. Those flocks which laid an average of about 185 eggs per bird produced an average labor income of $1,734 per flock. These figures show very clearly how important it is to secure high average egg production in order to make good labor income.

What most flock owners fail to realize is the need for keeping a flock that is highly efficient in the utilization of feed. The feed cost represents approximately 50 per cent of the total cost of producing eggs, so that it is highly important to have a flock that will utilize feed efficiency in transforming it into eggs. This point can be emphasized very clearly by stating that a flock that lays an average of 100 eggs per bird uses an average of 8⅓ pounds of feed for each dozen eggs laid. A flock that lays an average of 150 eggs per bird uses about 6 pounds of feed for each dozen eggs produced. A flock that averages 200 eggs per bird uses only 5 pounds of feed per dozen of eggs produced. In other words the higher the average egg production per bird, the fewer pounds of feed required to produce each dozen of eggs.

Since the average egg production of all flocks in Maryland is only 110 eggs, it is evident that many flocks are being kept at no profit at all. In fact, in many cases there is a loss of money. On the other hand, there are some flocks that make good money because the birds are from a bred-to-lay source and the management is efficient throughout.

The laying flock should comprise at least 75 per cent pullets because pullets will lay on the average about 30 or 40 more eggs per bird than yearling and older hens. A few yearling hens should be kept for breeding purposes, but from the standpoint of producing market eggs as efficiently as possible, three layers out of four in the flock should be pullets.

The average price of eggs from July 1 to December 31 is usually

about six cents per dozen higher than the average price of eggs from January 1 to June 30. It is clear, therefore, that in order to make the highest profits from flocks, good fall egg production is necessary. In fact, the more eggs secured during the six months from July 1 to December 31, the greater the profits. The results of the Connecticut survey bring this out quite clearly. Those flocks in which half or more of the total year's egg production was laid between July 1 and December 31 produced a labor income of $2,158 per farm. On the other hand, those flocks in which less than 40 per cent of the total year's egg production was laid between July 1 and December 31 produced a labor income of $678 per farm.

Pullets should commence laying in September or by the fore part of October. Earliness of sexual maturity is very important. Leghorn pullets should commence laying when they are about 160 to 180 days old, and pullets of the general purpose breeds should start when they are about 170 to 190 days old. Early fall egg production on the part of pullets is very necessary because the hens are usually in heavy molt about that time. The pullets should be well developed when they are placed in the laying house and should be carefully selected.

During recent years one of the chief obstacles to success in market egg production has been high pullet mortality. High mortality not only means an outright loss of birds, but it also means a loss of feed. It is also important to bear in mind that the survivors in flocks having a high mortality usually have a lower average egg production than the survivors in flocks having a low mortality.

In Connecticut it was found that those flocks having over 15 per cent laying house mortality produced a labor income of only $616 per flock. Those flocks in which mortality was approximately 10 per cent produced a labor income of $1,545 per flock. On the other hand, those flocks in which the laying house mortality was under 6 per cent produced an average labor income of $2,090 per flock. These figures show the vital importance of keeping mortality down to the minimum. The flock owner must ever be on the alert to watch for any outbreaks of disease and remove the cause as quickly as possible. Culling the flock repeatedly will help to reduce losses from mortality.

Many flock owners do not realize the time wasted in looking after a flock where there are few if any modern facilities available. The laying houses should be located conveniently and the flock owner should organize his work very carefully. The building should be well equipped and

everything possible should be done so that the labor in looking after the birds is utilized as efficiently as possible. Inefficient working methods often result in irregular feeding and irregular watering. Too many flock owners fail to realize that one day's neglect may do so much harm to the flock that it will take a week or ten days for the birds to recover and get back to a normal level of egg production.

A lack of an adequate watering system in the laying house means a great waste of time in carrying water. Poorly arranged laying houses and improperly equipped laying houses often result in wastage of time in feeding the layers, gathering the eggs, and keeping the litter dry. As a matter of fact, the higher the cost of feed and the lower the price of eggs, the greater the need for efficient flock management. Well planned working methods, a well arranged building, the right type of equipment, and a good business set-up make it possible for one man to look after as many as 1,500 birds and do a most efficient job.

The overhead costs in keeping a laying flock include such items as taxes, interest on the investment, depreciation of buildings, repairs and upkeep, and other items. In some cases the initial investment in buildings is excessive so that the charges for interest on the investment and depreciation are also excessive. While it is necessary to have good buildings, it is merely wasteful to have buildings that are too expensive. Keeping the overhead costs reasonably low promotes efficiency.

One of the greatest difficulties under which the owners of small-sized flocks labor is that their volume of business is so small that they have to market their eggs in the local community in which case the price is usually lower than the average city price and much lower than the price for the top class of eggs in the better eastern markets. Small-sized flocks and small volume of business are great handicaps. One way to overcome this, of course, is to market the eggs through a co-operative enterprise such as the Westminster Egg Auction, Westminster, Maryland. Producers who sell their eggs through the Westminster Egg Auction secure considerably higher prices than the Baltimore and other nearby market quotations.

It is possible to increase the volume of business done on many farm flocks, however, by producing hatching eggs for the hatcheries in the community. Some flock owners are also in a position to increase their volume of business by producing baby chicks. The selling of hatching eggs increases the returns because a premium over the price of market eggs should always be paid for hatching eggs. As a matter of fact, the hatchery operator usu-

ally can afford to pay a good premium if the flock owner is cooperating in a good poultry breeding and selection program in addition to having his flock tested officially for pullorum disease. Producing hatching eggs or baby chicks is a good way of increasing profits.

Finally, it might be said that experience over a period of years has shown clearly that those flock owners who keep records are usually the ones who make the most money in the poultry business. Careful records of the most important overhead costs, feed consumed, cost of raising the pullets, and other items should be kept in addition to some records on the amount of labor used in looking after the flock. Keeping a few essential records will enable every flock owner to manage his flock efficiently and thus make his poultry pay.

Seventy-five Years of Age

Condensed from The Shorthorn World

CHICAGO'S Union Stock Yards, the country's largest live stock market, was 75 years old on Christmas day.

During the three-quarter century period that this central market has been in operation, a total of 21½ billon dollars has been returned to stockmen and farmers for cattle, sheep, swine, and horses that they have sold.

O. T. Henkle, Vice-President and General Manager of the Union Stock Yard & Transit Company, operators of the Chicago Stock Yards, and holders of the original charter granted 75 years ago, states that an average of a million animals a month have passed through this market since it was opened in 1865.

Stock Yard historians have uncovered much interesting data and information relative to the early-day marketing methods prior to the opening of the Chicago Yards, as well as accounts of the first operations of the market.

High-lights of this material, as revealed by Mr. Henkle, are as follows:

The Chicago Stock Yards were founded after nearly forty years of trying other methods of selling livestock which had proven unsuccessful. Since the first cattle were slaughtered at Chicago in 1827 to furnish fresh meat for the garrison at Ft. Dearborn until the close of the Civil War, the marketing of livestock at that point has led a varied and chaotic existence.

At first, drovers purchased animals from the settlers in the rich river bottoms of the Wabash and other rivers to the South and herded them across the grass covered prairies to be slaughtered either in the open or in crude packing houses on the banks of the Chicago River.

In 1832 the first beef and pork were packed on the site of Chicago, to be shipped by boat to Eastern markets, thus bringing in outside demand to furnish additional competition. For about twenty years after this time, producers sold their stock to drovers or direct to packers on contracts made months in advance of delivery. Payment was made on the basis of the weight of the carcass and final settlement was frequently deferred until the product was sold in the East.

Chicago had two packing seasons each year. Cattle were fattened on the prairies until late Fall and then were slaughtered, packed into barrels and hurried

East by boat before navigation closed for the Winter. During the cold months, hogs were delivered to the packers either in carcass form or on foot and were packed for shipment in the Spring when the boats could reach the East again.

In 1848, the Illinois and Michigan canal was cut to the lake, the first railroad started reaching West from Chicago, and a series of planked roads stretched out across the surrounding swampy land so that trade could reach Chicago throughout the year. Taverns were constructed on the plank roads at the edge of the city, and they provided pens for the convenience of their patrons in holding their animals until buyers from the city could come out and trade. These were the first of what might be called livestock markets but each owner acted as his own salesman and settlement was deferred until after slaughter.

In 1852 the first two railroads reached Chicago from the East and brought in buyers for live animals at all seasons of the year. Livestock markets were established near the terminals of the railroads and for the first time scales were installed so that animals could be sold on foot. Commission men came into existence to offer expert salesmanship to the producers and for the first time livestock quotations began to appear in the daily press. Chicago was then, as now, the leading cattle center of the country but still lagged far behind Cincinnati and other relatively small packing centers further South in the handling of pork.

The Civil War revolutionized the flow of livestock to market, as the movement to the South was cut off, and large numbers of cattle and hogs were forced through the railroad terminals ending and beginning at Chicago. To handle this war-time boom, outside packers transferred their operations to the safer environments of Chicago and a large number of packing houses were constructed along the South branch of the river.

Soon the old tavern stock yards and railroad markets proved inadequate to handle the increased business and additional ones were being built or projected.

By 1864 the livestock trading in Chicago had become so scattered and inefficient that the packers, the railroads, the producers and all others interested in the industry moved by common consent to improve the very unsatisfactory conditions by establishing one large central market. It was planned to locate this new market South of the city, yet in direct contact by road with the packing houses and at a point midway between the nine railroads serving the city, so that all of their livestock business could

be handled with their own equipment to and from a central point over a junction railroad.

At the beginning of 1865, a half section of land, later increased to 345 acres, was purchased from Congressman John Wentworth and a perpetual charter was issued by the state legislature of Illinois on February 13th to the Union Stock Yard and Transit Company of Chicago to construct and operate the Chicago Union Stock Yard as it exists today.

Ground was first broken in June, 1865. Inasmuch as the chosen site was a swampy prairie, the first operations consisted of digging thirty miles of ditches and drains. As soon as the land became firm, large timbers were laid criss-cross and planked over several feet above the natural level and on this flooring the pens and sheds were soon taking form as an army of one thousand men, released from war-time duties, labored under military trained leaders.

A large hotel known as the Hough House which included an independent post-office; an exchange building for marketing agencies, which also housed a bank and a newspaper office; and other necessary structures to form a specialized business community were quickly constructed on the property and on Christmas Day, 1865, the market was ready for business.

From the beginning, the Chicago market has been the largest of its kind in the world and a greater number of buyers operate on it than at any other similar spot in the country.

Today, according to Mr. Henkle, more than 300 buyers representing large and small packers in the Midwest and East as well as numerous feeder cattle buyers seeking unfinished livestock, operate on this market every business day of the year. Between them, he points out, they furnish active competition for every grade and class of livestock; and price levels established on the Chicago market through the free play of supply and demand are used as the basis for trading throughout this country.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

Beef Cattle—By Roscoe R. Snapp, Asso. Prof. Animal Husbandry, Univ. of Illinois. John Wiley & Son, Inc. $4.00.
(See Farmers Digest, November, 1939)

Beekeeping—By Everett Franklin Phillips, Professor of Apiculture, Cornell University. Published by the Macmillan Co. $4.00.
(See Farmers Digest, July, 1940)

Breeding Your Own, or Raising Colts for Pleasure and Profit—By Clarence E. Bosworth. The Derrydale Press ($10.00). A book suitable for the breeders of hunters' and saddle horses.

Conservation in the United States—By Gustafson, Ries, Guise and Hamilton. Comstock Pub. Co. $3.00.
(See Farmers Digest, July, 1940)

Dairy Cattle and Milk Production—By Clarence H. Eckles, B.S.A., D.Sc., late Chief, Div. of Dairy Husbandry, Univ. of Minnesota. Macmillan Company. $3.60.
(See Farmers Digest, February, 1940)

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.
(See Farmers Digest, October, 1939)

Farm Meats—By M. D. Helser, B.S.A., M.S., Prof. Animal Husbandry, Iowa State College. Macmillan Co. $2.90.
(See Farmers Digest, January, 1940)

Farm Records—By John A. Hopkins, Ph.D., Asso. Prof. of Eco., Iowa State Col.; pub. by Collegiate Press. $2.50.
(See Farmers Digest, October, 1940)

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.
(See Farmers Digest, January, 1941)

Livestock and Poultry Diseases—By W. A. Billings, Asst. Prof. of Vet. Medicine, Univ. of Minnesota. Macmillan Co. $3.50.
(See Farmers Digest, June, 1940)

Livestock Judging Handbook—By Julius E. Nordby, Asst. Prof. Animal Husb., Univ. Idaho, Bu. Animal Industry, 1938, and W. Malcolm Beeson, Ph.D., Asst. Prof. Animal Husb., Univ. Idaho. The Interstate Printers. $2.60.
(See Farmers Digest, February, 1941)

Poultry Husbandry—By Morley A. Jull, Prof. of Poultry Husbandry, Univ. of Maryland. McGraw, Hill & Co. $4.00.
(See Farmers Digest, July, 1939)

Pork Production—By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. Macmillan Co. $3.75.
(See Farmers Digest, September, 1939)

Poisonous Plants of the United States—By Walter Conrad Muenscher, Prof. Botany, Cornell. Macmillan Company. $3.50.
(See Farmers Digest, November, 1940)

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Co. $4.00.
(See Farmers Digest, September, 1940)

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Department of Agriculture. McGraw-Hill Book Company, Inc. $6.00.
(See Farmers Digest, December, 1940)

Vegetable Crops—By Homer C. Thompson, Ph.D., Prof. Veg. Crops, Cornell Univ. Pub. McGraw-Hill Book Co. $5.00.
(See Farmers Digest, May, 1940)

The Western Horse — Its Training, Type and Marketing. By John A. Gorman, Asso. Prof. Animal Production, Univ. of Wyoming. The Interstate Printers and Publishers. $1.65.
(See Farmers Digest, March, 1941)

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